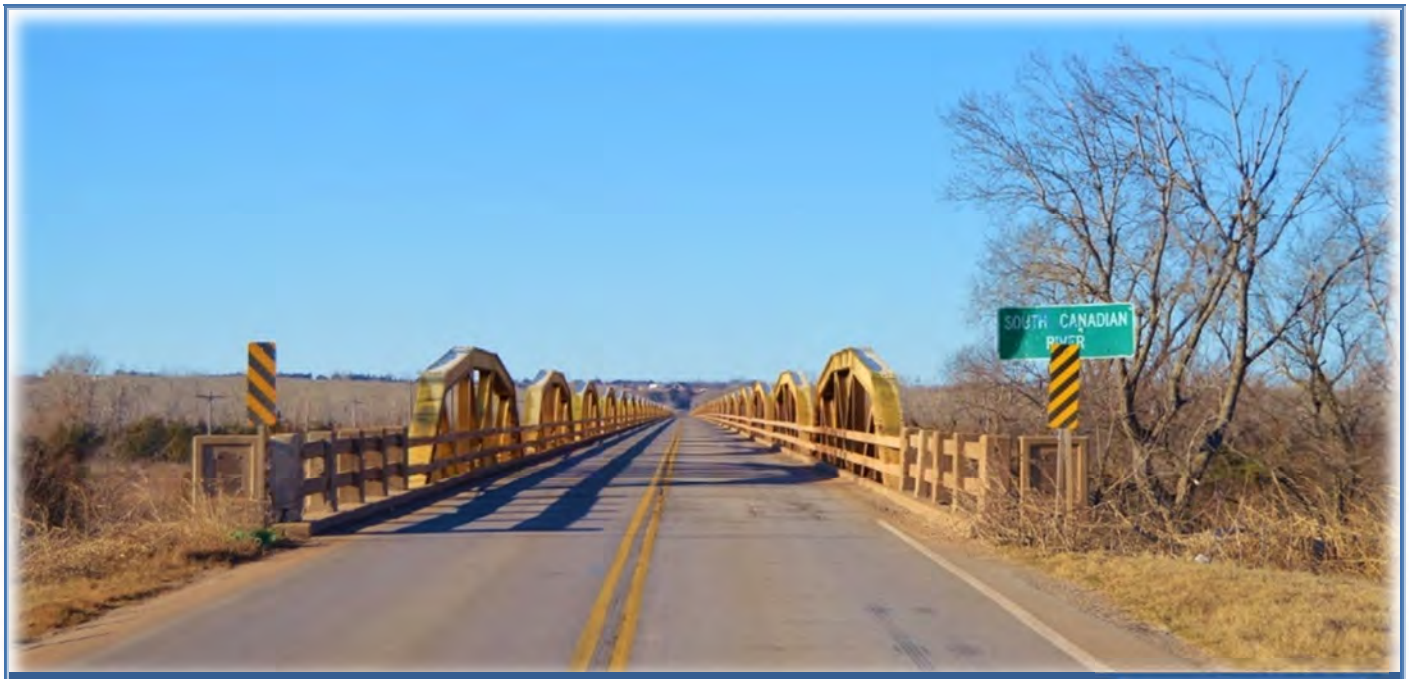

US-281 at the South Canadian River and Associated Roadway Section

Caddo, Canadian, Blaine Counties

Alternatives Analysis Report

Draft – September 2016

Prepared For:
The Oklahoma Department of Transportation

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1.0 INTRODUCTION

This report analyzes alternatives for the rehabilitation or replacement of the historic US-281 Bridge spanning the South Canadian River in Caddo and Canadian Counties, Oklahoma. The study area for this project also extends into Blaine County. This portion of US-281 is also a section of historic Route 66. The bridge is known by a number of names, including the William H. Murray Bridge, the "Pony Bridge" (a local nickname), the Grapes of Wrath Bridge (as a portion of the 1940 movie was filmed on the bridge), and the Bridgeport Bridge. The bridge crosses the South Canadian River, and is located in portions of both Caddo and Canadian Counties. This bridge is a historically significant Route 66 structure and a key feature of the Oklahoma Route 66 National Scenic Byway. A draft Interagency Agreement with the State Historic Preservation Office (SHPO), currently under ODOT review for implementation as part of a Memorandum of Agreement with SHPO, calls for preserving this structure in place. The Oklahoma Route 66 Scenic Byway Corridor Management Plan, which provides guidance on the management of Route 66 resources within Oklahoma, also calls for the preservation of historic roadways and bridges when feasible. The historic bridge is also located within the Bridgeport Hill-Hydro Route 66 Segment Historic District, which is listed in the National Register of Historic Places (NRHP). All of the approach roadways to the bridge are part of the historic district, including the entire roadway from the south end of the bridge west to Hydro and the roadway from the north end of the bridge to Bridgeport Hill, northeast of the project.

As part of the planning process and in accordance with Federal Highway Administration (FHWA) guidance on Section 4(f) resources and Oklahoma Department of Transportation (ODOT) guidelines, reasonable alternatives to the proposed action are developed and evaluated. Section 4(f) regulations (23 CFR 774) state that FHWA may not approve an action that uses publicly-owned park and recreation land, publicly-owned wildlife and waterfowl refuges or publicly- or privately-owned historic properties, when there is a feasible and prudent alternative to the action. In most cases, actions that use an historic bridge are those that result in demolition/removal of the historic structure or that reconstruct it to such an extent that the character-defining features that give it historic significance are eliminated or substantially impaired. To simplify the 4(f) process, FHWA has established a nationwide Programmatic 4(f) evaluation for historic bridges that specifies a limited set of avoidance alternatives that must be evaluated and rejected before an action that uses an historic bridge (or other historic roadway feature associated with the Historic District) can be approved.

Further, as outlined in 23 CFR 774.3, FHWA may not approve the use of a Section 4(f) property unless it first determines that there is no prudent and feasible alternative to the use of land from the property, or that any use of Section 4(f) property would be a *de minimis* impact. A *de minimis* impact is one that, after taking into account avoidance, minimization, mitigation, and

enhancement measures, results in no adverse effect to the activities, features, or attributes qualifying a property for protection under Section 4(f). An alternative is not prudent, according to 23 CFR 774.17(3), if it compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated Need and Purpose. A project is not feasible if it cannot be built as a matter of sound engineering judgment. Alternatives that do not adequately meet the project's need and purpose can be dropped from further consideration. If an avoidance alternative exists that is both feasible and prudent, it must be selected by FHWA. ODOT and FHWA will assess the feasibility and prudence of avoidance alternatives based in part on the information generated in this report. This information may also be used by the agencies to evaluate and incorporate measures to minimize or mitigate harm resulting from use of this historic bridge or other historic roadway resource that cannot be avoided.

The purpose of the project is to provide a safe crossing over the South Canadian River on US-281 in Canadian and Caddo Counties, Oklahoma, while also preserving the historic integrity of the bridge and the historic district. Approximately 1,300 vehicles per day (vpd) use US-281, and future traffic volumes are estimated to increase to 2,100 vpd in 2039. Medium to heavy truck traffic accounts for over 40 percent of total traffic volumes. As this stretch of US-281 is an alignment of historic Route 66, tourism in the region and specifically along the corridor must also be considered. As such, a goal of the project is to maintain traffic along the corridor.

According to current design criteria, the existing roadway and bridge have deficient travel lane and shoulder widths. The project proposes to address safety concerns while also taking into account the historic nature of both the bridge over the South Canadian River and the roadway facility. Alternatives for constructing the proposed improvements on the existing alignment, as well as several alternatives on a new alignment, have been developed and analyzed. A matrix has been compiled (see **Section 5.5**) to compare the alternatives based on construction costs, right-of-way and utility impacts, and environmental impacts.

This alternatives analysis report will document the conditions of the existing roadway and the alternatives considered, analyze the impacts of the proposed alternatives, provide estimated costs of each alternative, and discuss the evaluation components that will be used to identify a preferred alternative. Utilizing the information from this report, ODOT will receive input from stakeholders and consulting parties, conduct a public meeting for the project, and then select a preferred alternative.

2.0 EXISTING CONDITIONS

2.1. Location

The subject project is located on US-281 – an historic section of Route 66. The bridge is individually eligible for listing in the NRHP, and the entire roadway facility within the project area is part of the NRHP-listed Bridgeport Hill-Hydro Route 66 Segment Historic District. All of the approach roadways to the bridge are part of the District, including the entire roadway from the south end of the bridge west to Hydro and the roadway from the north end of the bridge to Bridgeport Hill, northeast of the project. The proposed project study area is located within portions of Caddo, Blaine, and Canadian Counties. The surrounding land use is largely rural or agricultural, with some sparse, intermittent development like residences and agricultural buildings. Assorted oil and gas wells are also located in and near the project area. Near the project vicinity on the southwest end, south of I-40, there are gas stations serving travelers on the interstate. South of the project, along I-40, there is a Cimarex field office serving the oil and gas activity in the area. The town of Hinton, Oklahoma, is located approximately five miles southwest of the project area, and the town of Geary, Oklahoma, is located approximately 6.5 miles north of the project area.

There are three existing bridges along the corridor. The US-281 Bridgeport Bridge (Bridge "A" – NBI 04085) is a 3,900-foot long Warren pony truss that crosses the South Canadian River. Bridge "B", carrying US-281 over an Unnamed Creek (Tower Bridge – NBI 04076), is a 378-foot long steel I-beam bridge. Bridge "C", also carrying US-281 over an Unnamed Creek (NBI – 03896), is a 2-10'x5'x89' reinforced concrete box (RCB) culvert. All of these bridge structures are contributing features to the NRHP-listed Bridgeport Hill-Hydro Route 66 Segment Historic District. Because of their proximity to the project area, Bridges "B" and "C" are included in the discussion of some of the proposed alternatives; however, the main focus of this analysis report is Bridge "A". The project location and study area are shown in **Figure 1 and Figure 2**.

A reconnaissance study was performed in 2015 by CP&Y to identify environmental, social, and economic constraints within the study area shown on **Figure 2**. A prior reconnaissance study was produced by Cobb Engineering in 2009 for a smaller area than is currently being studied. The 2009 study identified utilities, property owners, accident history, existing bridge and hydrologic conditions, and environmental constraints within the smaller study area. Both reconnaissance reports are provided in **Appendix A**.

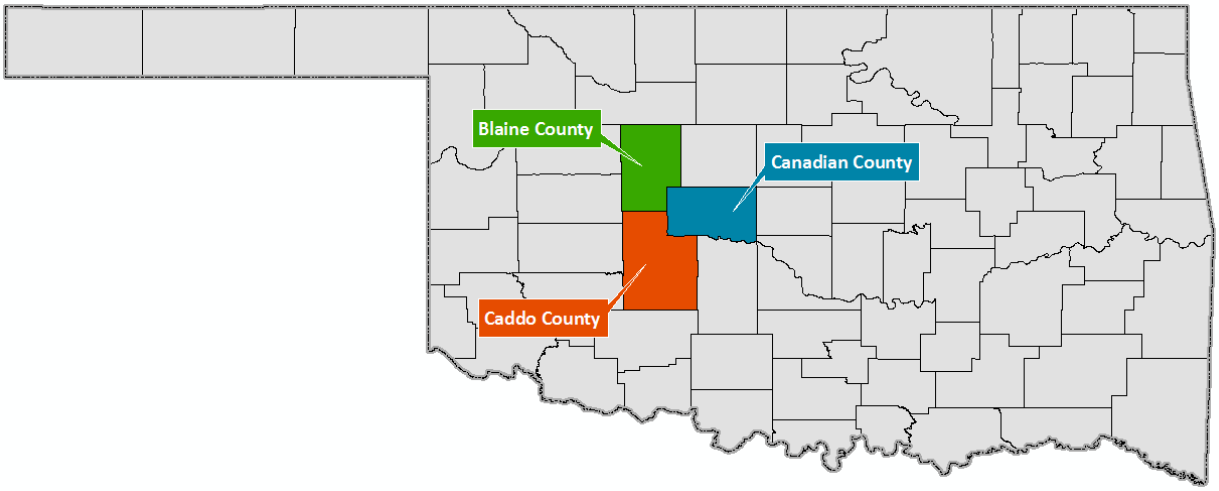

Figure 1. Oklahoma County Map – Caddo, Blaine, and Canadian Counties

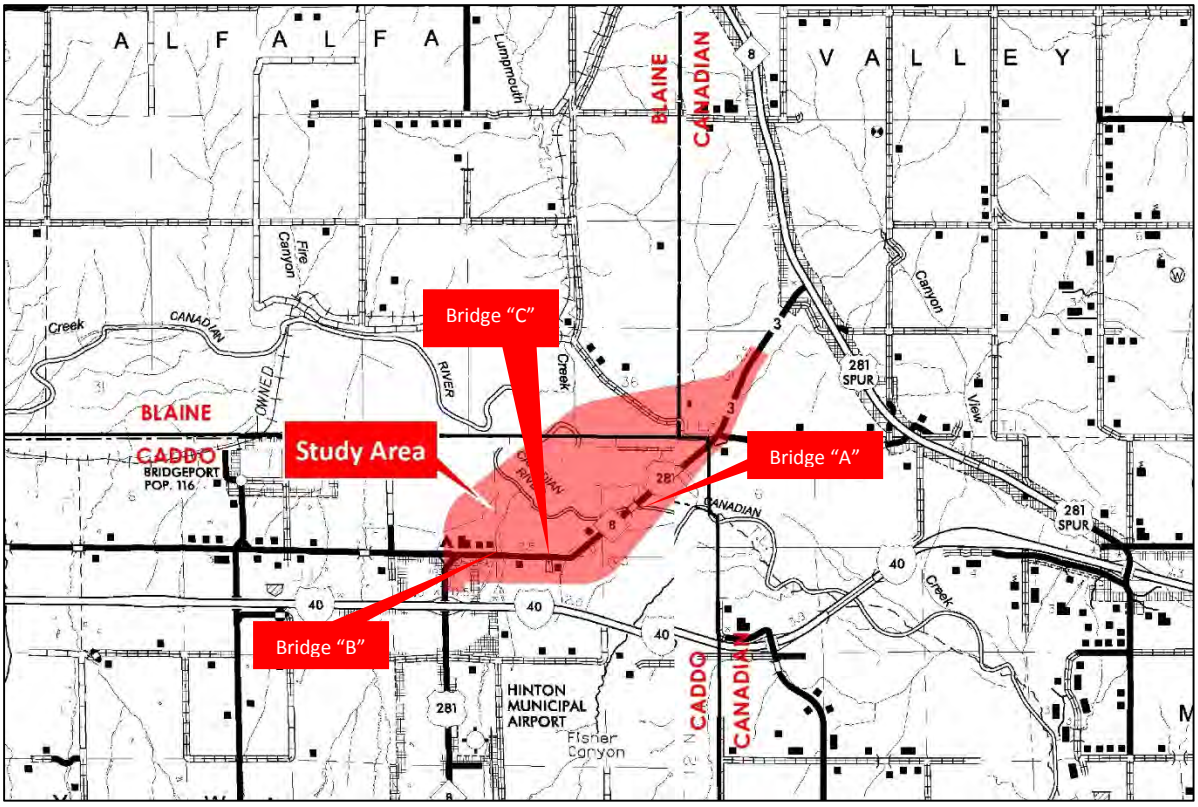

Figure 2. Highway Map of the Study Area

2.2. Roadway

2.2.1. Highway Characteristics

This portion of US-281 was originally constructed in the early 1930s as US Highway 66. The original plans were developed under Federal Aid Project No. 164-H. Within the project area, US-281 is classified as a Rural Minor Arterial route. All sections of US-281 are listed as part of the National Highway System (NHS). Beginning at the US-281/I-40 Junction, the posted speed limit is 55 mph to a point that is approximately 1,000 feet west of Bridge "B" (Tower Bridge); it then changes to 65 mph throughout the remaining corridor. The topography of the project can generally be classified as rolling terrain. The original typical section consisted of two 9-foot lanes with a concrete paving surface and no shoulders (**Figure 3**). The majority of the road is still 18 feet wide but has segments of asphalt overlays. The typical roadway embankment slopes vary from 1:2 to 1:4.

Figure 3. Existing Roadway

The exception to this roadway section is located approximately 0.25 mile northeast of the end of the Bridgeport Bridge (Bridge "A") where the roadway has been reconstructed to a 40 foot wide typical section. This portion of roadway was improved in 1994 under State Job No. 10150(04).

2.2.1.1. Geometrics

There are four horizontal curves throughout the extents of the study area. The first horizontal curve is located approximately 1,600 feet west of Bridge "B". The curve has a radius of 1,140 feet which equates to a 5-degree curve. The roadway cross-slope is unknown; however, the existing posted speed for this curve is 55 mph. The rest of the existing alignment, heading east, is posted at 65 mph. The next horizontal curve is located 900 feet east of Bridge "B" and has a radius of 11,459 feet. This curve appears to have no superelevation, or "bank", and would currently meet the criteria for a design speed of 60 mph. The next curve is located at Bridge "C" and has a radius

of 1637.28 feet, which equates to a 3.5-degree curve (**Figure 4**). The roadway cross-slope of this curve is unknown. The last horizontal curve is located 1,400 feet northeast of Bridge "A" (Bridgeport Bridge) and has a radius of 2864.79 feet, which equates to a 2-degree curve. The existing cross-slope is 4.5 percent and meets current criteria for a 55 mph design. It would appear that none of the horizontal curves are deficient, based on initial fieldwork.

Figure 4. Existing Curve West of Bridge "A"

Existing grades vary from zero to five percent along the project corridor with the majority of the steep grades on the west end of the project. Many of the vertical curves within the project area do not conform to current AASHTO design criteria for sight distance for the posted speed limit of 65 mph. There are 12 vertical curves along the corridor: 5 are classified as sag vertical curves and 7 are classified as crest vertical curves. Of the 5 sag vertical curves, 3 do not meet current AASHTO design criteria, nor do 3 of the 7 crest vertical curves. See **Table 1** for a summary of the curves that do not meet current AASHTO design criteria. The station locations of the existing curves are based on the as-built plans (**Appendix D**).

Table 1. Existing US-281 Deficient Vertical Curves

STATION	CURVE TYPE	K VALUE	DESIGN SPEED
401+00	CREST	154	60 MPH
405+00	SAG	143	60 MPH
412+00	SAG	116	55 MPH
419+00	CREST	132	55 MPH
426+50	SAG	86	45 MPH
435+00	CREST	114	55 MPH

2.2.1.2. Drainage

The main channel of the South Canadian River generally flows southeasterly through the study area. In general, the existing ground located to the west of Bridge "A" slopes northerly towards

the South Canadian River, and the existing ground located to the east of Bridge "A" slopes southerly towards the South Canadian River. The preliminary hydraulic analyses for the three bridge structures are included in **Appendix H**. The majority of the drainage structures along the existing alignment were originally constructed in the 1930s. The conditions of these culverts were not investigated in detail, though most of the structures are anticipated to be replaced. See **Table 2** for the Existing US-281 Drainage Structure summary. The station locations of the existing drainage structures are based on the as-built plans for each structure (**Appendix D**).

Table 2. Existing US-281 Drainage Structures

STRUCTURE #	STATION	STRUCTURE SIZE	STRUCTURE TYPE**	DRAINAGE AREA (ACRES)
1	449+47	4'x3'	RCB	70.0
2	434+75	30"	RCP	16.0
3	430+00	24"	RCP	4.0
4	424+93	8'x8'	RCB	205.0
5	419+60	18"	RCP	1.0
6	07+50	24"	RCP	5.0
7	15+00	2 - 6'x2'	RCB	75.0

** RCB = reinforced concrete box culvert
RCP = reinforced concrete pipe

2.2.2. Traffic

The traffic data provided from ODOT for the original reconnaissance study (dated 2009) showed the existing ADT at 1,300 vpd and a projection for 2039 of 2,100 vpd. Lee Engineering performed an existing traffic analysis as part of this Alternatives Analysis Report which included turning movements, traffic volumes, and classification. The turning movements for the peak hour along US-281 in the study area were all below 100 vehicles per hour. The existing average volumes along US-281 were just above 1,400 vpd with a truck volume of over 40 percent. See **Appendix B** for the complete traffic report.

2.2.3. Collision and Accident History

ODOT provided ten year accident data (2005 – 2015) within the project study area. A total of 15 accidents have been recorded in the last ten years, including six which resulted in an injury. A majority of the accidents were either rollover or head-on collisions. These type of accidents attributed to one or more of the following conditions: inadequate bridge design, inadequate roadway design, or excessive vehicle speed. A Safety Design Review Summary was prepared for this segment of US-281 and is included as Appendix M.

2.2.4. Utilities

Existing utilities within the project study area include overhead power, underground telephone, underground fiber optic, and several gas and oil pipelines. The locations of utilities within the project extents are shown on the conceptual drawings included with this report (**Appendix K**).

2.2.4.1. Telephone and Fiber Optic

There are four companies that own telephone or fiber optic utilities within the project corridor: Hinton Telephone, AT&T, Dobson Technologies, and Pioneer Telephone.

- Hinton telephone has an underground telephone line located on the west side of US-281 up to Bridge "B" (Tower Bridge); it then switches to the south side up to Bridge "C". Hinton telephone has a fiber optic line that runs on the east and south sides of US-281 up to just east of Bridge "B"; it then crosses to the north and west sides of US-281. The fiber optic line is carried across Bridge "A" (Bridgeport Bridge) in a black pipe. The line continues on the east side of US-281 and then follows on the south side of historic Route 66.
- AT&T has a fiber optic line that is located south and east of US-281 and is carried on Bridge "A" (Bridgeport Bridge). It then extends on the south and east side of US-281 and historic Route 66.
- Dobson Technologies has a fiber optic line that crosses US-281 approximately 1,600 feet north of I-40. It then continues east on the south side of US-281 up to Bridge "A" (Bridgeport Bridge). The information regarding the fiber optic line provided from Dobson ends on the southwest side of Bridge "A".
- A Pioneer Telephone line is located in the northeast quadrant of the project area. It enters the study area on the west side of NS-263 Section Line Road. It continues south to the EW-101 section line and follows along the south side until it crosses US-281 just north of the US-281/Old SH 66. It then follows US-281 on the east side going north.

2.2.4.2. Electric

Caddo Electric owns the majority of the power lines throughout the project extents. One of the existing power lines crosses US-281 in the vicinity of Bridge "B" and continues on the south and east side of the highway within the existing rights-of-way. There are several locations where power lines cross US-281 to the north of Bridge "A".

Public Service Company of Oklahoma (PSO) has overhead power lines in the vicinity of I-40. The power lines are located on both sides of the highway from the I-40 interchange north to the location in which US-281 curves and proceeds east.

2.2.4.3. Pipelines

There are wells and pipelines owned by a total of five companies within the study area: EnLink, Enogex, ONEOK, Devon Energy, and Mustang Fuel.

- EnLink has several gas pipelines within the study area, ranging from 4-inch to 24-inches in diameter. The 24-inch gas line runs north and south to the east of Bridge "B" (Tower Bridge). There are several feeder lines from the wells in the area that tie into the 24-inch gas line.
- Enogex (Enable Midstream) has a 4-inch gas line that is located on the southeast side of Bridge "A". It follows a southeasterly direction where it crosses historic Route 66 approximately 2,800 feet east of US-281.
- ONEOK has a gas line of unknown size that is located in the southeast quadrant of the study area. These lines do not cross the existing US-281 alignment within the project limits.
- Devon Energy has six wells in the project study area and does not have any pipelines.
- Mustang Fuel has a 6-inch gas line that runs north and south along the project corridor and crosses US-281 approximately 400 feet west of the beginning of Bridge "A" (Bridgeport Bridge).

For further detail on utility information, please refer to the utility cost summaries In **Appendix C** and the attached conceptual drawings.

2.2.5. Right-of-Way

Existing right-of-way limits are shown on the conceptual plans (**Appendix K**). Statutory right-of-way along the section lines was assumed to be 66 feet total along all section line roads. Property limits and ownerships were determined and identified by the data reconnaissance report. Existing US-281 right-of-way width within the project area is generally 100 feet wide centered on the existing centerline alignment, with the exception of the right-of-way around the vicinity of Bridge "A" (Bridgeport Bridge) where it extends approximately 500 feet south and 200 feet north of the existing alignment.

2.3. Bridge "A" – Bridgeport Bridge – US-281 over South Canadian River

The existing bridge structure of Bridge "A", the Bridgeport Bridge, carrying US-281 over South Canadian River, consists of 38 100-foot pony truss spans with two 36-foot steel I-beam end spans. Existing bridge plans are provided in **Appendix D**. The existing bridge utilized Oklahoma standard details when it was constructed, which are now obsolete (see **Appendix E**).

The Secretary of the Interior's standards, as outlined in the AASHTO *Guidelines for Historic Bridge Rehabilitation and Replacement,* provide guidance on what makes a bridge historic and what rehabilitation measures can be taken while still maintaining the historic integrity of the bridge. For this structure, the components that are generally considered to have historical significance are the large scale of the bridge, as it is the second longest bridge listed in the Oklahoma Historic Bridge Inventory, the camelback truss configuration, and the location of the bridge on a historic segment of Route 66. The alternatives analysis will consider maintaining these historic features.

The AASHTO guidelines also consider if structures are of high or average level of significance. The Bridgeport Bridge is considered to be of high significance. The Oklahoma Historic Bridge Survey update, Spans of Time (2007), cites US-281 over South Canadian River to be one of seventeen Historic US Highway 66 bridges in Oklahoma listed in the NRHP. The bridge is the only one of the six historic-age bridges in Canadian County listed in the NHRP. It is one of 147 camelback pony truss structures in the State of Oklahoma at the time of the 2007 survey, and one of the 12 camelback pony truss bridges that are NHRP-eligible. It is arguably the most historic bridge in the state of Oklahoma, and it is the longest bridge west of the Mississippi River constructed along Route 66.

The condition of the current bridge was evaluated by reviewing the 2011 ODOT Bridge Inspection Report (BIR), the 2013 Fracture Critical Bridge Inspection Report (FC-BIR), and the 2014 Other Special Bridge Inspection Report (OS-BIR) and by considering observations from a site visit conducted in January 2016. The three bridge inspection reports for the Bridgeport Bridge are provided in **Appendix F.** All bridge inspection reports include condition and appraisal ratings for various line items. Condition ratings compare bridge material elements to their as-built condition. Appraisal ratings evaluate the level of service the bridge currently provides compared to how a new structure would perform. Itemized condition and appraisal ratings both use a zero-to-nine scale with zero representing the worst condition. The descriptions associated with the individual numerical scores differ between the two rating systems. In addition to the ratings, the BIR provides notes about the location and extent of any observed deterioration and overall measures of bridge sufficiency and health. The 2013 FC-BIR includes an updated BIR, a detailed account of deterioration of bridge members, recommendations for maintenance measures, and how quickly the maintenance should be completed. The 2014 OS-BIR also includes an updated BIR and tracks

any changes to deterioration since the 2013 FC-BIR. Information on maintenance and repairs that have been performed on the bridge between September 11, 2011 and April 15, 2015 was also reviewed and provided in **Appendix F.**

2.3.1. Functionality

The functionality of a bridge is a measure of how well the bridge structure is able to serve its designed purpose. It is a measure of the structure's quality of service to its users. As stated in *Title 23-Code of Federal Regulations, Non-regulatory Supplement for Part 650, Subpart D*, for a bridge to be considered functionally obsolete, it must meet the following qualifications:

1. *An appraisal rating of 3 or less for*
    - *Item 68 – Deck Geometry; or*
    - *Item 69 – Underclearances; or*
    - *Item 72 – Approach Roadway Alignment; or*
2. *An appraisal rating of 3 for*
    - *Item 67 – Structural Condition; or*
    - *Item 71 – Waterway Adequacy.*

The ratings on the 2014 OS-BIR, the 2013 FC-BIR, and the 2011 BIR for US-281 over South Canadian River do not qualify this bridge as functionally obsolete; however, the narrow travel lanes and lack of shoulders on the deck do not meet current AASHTO or ODOT guidelines. The deck geometry (Item 68) was given a rating of 4 (tolerable) due to a sub-standard bridge width. Structural condition (Item 67) and waterway adequacy (Item 71) also received minimum acceptable ratings of 4 (min tolerable and tolerable, respectively).

The existing bridge deck only provides a 24-foot clear (curb-to-curb) roadway width, consisting of two 12-foot lanes with no shoulders (**Figure 5**). Current ODOT standards for two-lane rural facilities provide a wider 40-foot clear roadway, with two 12-foot lanes and two 8-foot shoulders. Although the bridge is not classified as functionally obsolete, the existing horizontal clearance is much less than the 32-foot minimum set by AASHTO.

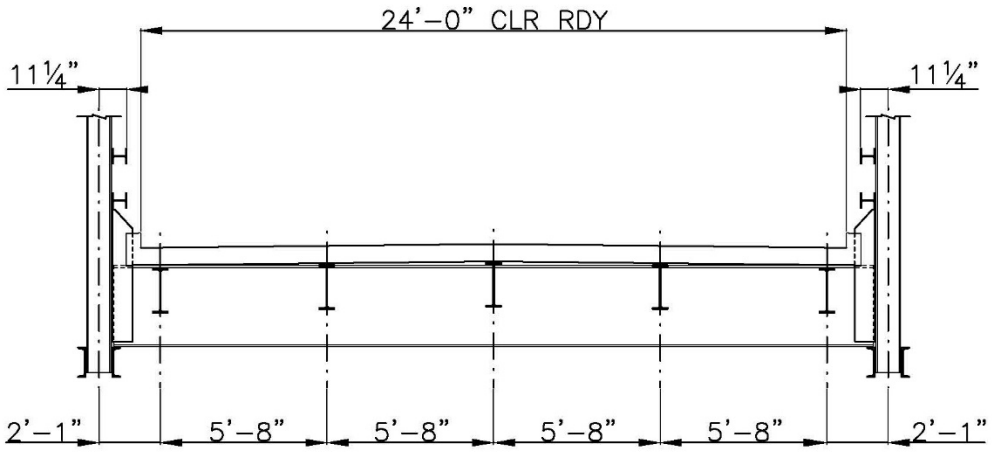

Figure 5. Typical Section of Existing Bridgeport Bridge Truss Span Superstructure

With a confined bridge width, there is limited space for drivers to increase distance between themselves and other traffic using the structure. This is particularly true for large trucks and commercial vehicles which account for over 40 percent of total traffic, according to the traffic data collected. **Figure 6** shows a large truck on the bridge to give perspective on the narrow roadway width. At the site visit, rail and truss damage was noted which indicates traffic was potentially forced to drive too close to the railing when there was oncoming traffic.

Figure 6. Truck on Bridge, Looking Southwest

2.3.2. Structural Condition

Structurally deficient bridges are characterized by deterioration and/or damage of significant load carrying structural components that are in poor or worse condition. A structurally deficient designation may also be given to structures which do not have adequate hydraulic opening for a waterway crossing, resulting in water overtopping the structure and hindering traffic. As stated in *Title 23-Code of Federal Regulations, Non-regulatory Supplement for Part 650, Subpart D*, for a bridge to be considered structurally deficient, it must meet the following qualifications:

1. *An condition rating of 4 or less for*
    - *Item 58 – Deck; or*
    - *Item 59 – Superstructures; or*
    - *Item 60 – Substructures; or*
    - *Item 62 – Culvert and Retaining Walls; or*
2. *An appraisal rating of 2 or less for*
    - *Item 67 – Structural Condition; or*
    - *Item 71 – Waterway Adequacy.*

By the conditions above, the ratings from the 2014 OS-BIR and the 2013 FC-BIR qualify the bridge as structurally deficient. The superstructure (Item 59) was rated 4 (Poor) while the deck (Item 58) and substructures (Item 60) were rated a 5 (Fair). The bridge currently operates with no posted weight limit.

A sufficiency rating is a method to assess the integrity of a bridge. This rating is based on structural evaluation, functionality, and the public necessity of the structure. Sufficiency ratings are given on scale from 0 to 100, with 0 being completely insufficient and 100 being completely sufficient. US-281 over South Canadian River received a sufficiency rating of 34.9 on the 2014 OS-BIR and 2013 FC-BIR.

A health index is a weighted measure of average condition of the structure, taking into account the conditions of multiple structural elements. Like the sufficiency rating, the health index is computed on a scale from 0 to 100, with 0 being the worst condition and 100 being the best condition. According to the 2014 OS-BIR, this bridge has a health index of 53.8.

The ODOT BIRs have condition notes and ratings for multiple bridge elements which paint a picture of why the bridge received the reported health index and sufficiency rating. The inspector notes were verified by an independent site visit. Multiple bridge elements are discussed below, referring to the ODOT BIR and the site visit to assess condition.

Concrete Deck and Joints

On the 2014 ODOT OS-BIR and 2013 FC-BIR, the bridge deck (Item 58) was assigned a condition rating of 5 (Fair). The deck was covered with approximately two inches of asphalt overlay (**Figure 7 and Figure 8**). The deck overlay exhibited longitudinal cracks throughout all spans, primarily along the centerline and in wheel ruts (**Figure 9**). A few small potholes in the overlay were noted in wheel ruts during the site visit.

The 2013 FC-BIR noted several transverse cracks approximately four to six feet from expansion joints in the truss spans, likely caused by deck lifting. Spalls with exposed and corroded reinforcing steel were present on the underside of the deck near expansion joints (**Figure 10**). Cracks, minor spalling, staining, and concrete efflorescence were commonly found in exterior stringer bays and overhangs on the underside of the deck. The deck of each truss span exhibited expansion from the center of the span out (**Figure 11**). Expansion joints remained open, but the expansion bearings were near the limit of movement. End floor beams also showed evidence of deck growth with sweep, web rotation, and damages to the stringer connection angles. Transverse cracking in the soffit was visible on the underside of the bridge (**Figure 12**). There were several large sections of the concrete curb which had spalled and exposed reinforcing steel (**Figure 13 and Figure 14**).

Figure 7. View of Deck, Looking Northeast

Figure 8. Measuring Asphalt Overlay Depth at Deck Drain Location

Figure 9. Typical Longitudinal Cracking in Asphalt Overlay

Figure 10. Typical Expansion Joint

Figure 11. Spalls with Exposed Rebar and Asphalt Fill at Expansion Joint under Deck

Figure 12. Transverse Cracking in Soffit

Figure 13. Typical Overhang Spall

Figure 14. Typical Curb Spall

Superstructure – Truss

The superstructure (Item 59) had a condition rating of 4 (Poor) on the 2014 OS-BIR (see **Figure 15** for truss typical detail). The primary bridge elements that contributed to the superstructure condition were steel beams of the end spans, steel trusses, steel floor beams, steel gusset plates, bearing assemblies, and bridge railing.

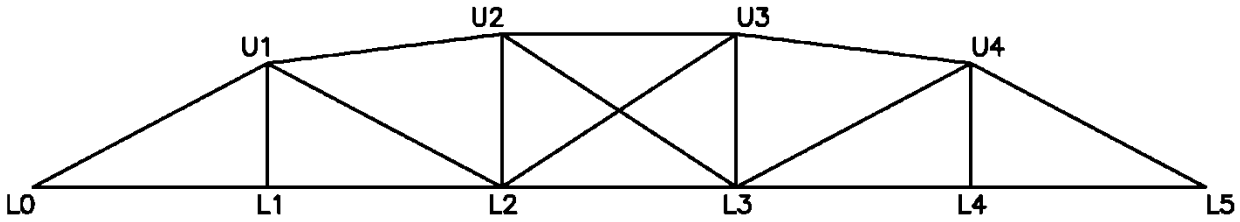

Figure 15. Truss Diagram with Node Labels

The primary damage to the trusses above the deck was assumed to be due to vehicular collision. It was common for the top plates and flanges of the top chord of the trusses to be bent or wavy (**Figure 16**). In isolated locations, severe damage was observed, including torn flanges, detached lacing, sheared rivets, bent gusset plates, and corrosion at impact locations. Some of these larger damage areas are shown in **Figure 17** through **Figure 20** below. Typically, welds between the railing and truss members were corroded (**Figure 22**) and isolated locations had significant pack rust with possible section loss to the truss web. Pack rust was developing at gusset plate seams in several truss upper chords, causing gusset plates to bow slightly.

Figure 16. Typical Truss Upper Chord Collision Damage

Figure 17. Gusset Plate Bowed Up and Corroded at West Truss, Span 30

Figure 18. Disconnected Lacing with Sheared Rivets at West Truss, Span 31

Figure 19. Torn Flange and Gusset Plate at West Truss, Span 31

Figure 20. Bent Flanges and Rail, Disconnected Lacing, Sheared Rivets at West Truss, Span 31

Figure 21. Bent, Torn, and Corroded Top Flange at East Truss, Span 14

Figure 22. Corrosion at Welded Connection of Rail to Truss Member

Most of the damage to the lower truss chords was located at the ends of the truss, near bearings and floor beams. Corrosion was common at the truss connection to the floor beam system and at inboard gusset plates L2 and L3 due to water drainage through deck joints and expansion joints (see **Figure 23**). Lower chord end gusset plates were typically bowed due to pack rust. While both inboard and outboard gussets were bowed, the bend was more severe for inboard gussets which were found to be bowed up to one inch out of plane. The 2013 FC-BIR notes nine locations where cracks were found in the inboard gusset plate near the bearing pin. Six of these cracks were previously noted and were strengthened by welding additional steel to the gusset plate at the crack locations. However, three locations were new cracks, measuring 9.25, 3.00, and 6.25 inches long. In the 2014 OS-BIR, the new cracks had all increased in length to become 15.125, 6.75, and 10.00 inches, respectively. A new 4.75-inch crack was also observed at the time of the 2014 OS-BIR. Pack rust with pitting was common on truss bearing assemblies with greater deterioration at expansion joints (See **Figure 24 and Figure 25**). Several expansion bearings were rotated to their limits due to apparent pavement expansion, according to the report. The 2013 FC-BIR also states that approximately 25 percent of expansion bearing assembly anchor bolts were corroded through or broken.

Figure 23. Corrosion at Inboard L2 Gusset Plate Beneath Deck Construction Joint

Figure 24. Deterioration of Pinned Bearing Assembly and Truss Lower Chord at Expansion Joint Between Trusses

Figure 25. Outboard Truss End at Pinned Bearing

Superstructure – Stringers and Floor Beams

In addition to the trusses and bearings, the floor system between trusses beneath the deck contributed to the Superstructure condition rating. The floor beams and stringers were both rated as 4 (Poor) in the 2013 FC-BIR and the floor system bracing was rated 5 (Fair). Typically, end floor beams were stiff-legged at the piers, as shown in **Figure 26**, to mitigate twisting of the bottom flange away from the joint. The 2014 OS-BIR indicated some floor beam sweeps up to 0.875 inch out of plane. Several end floor beams exhibited heavy corrosion with section loss at expansion joints, corrosion holes in the web, and cracks between the top flange and connection angles to the truss. Interior floor beams were typically corroded on the top flange with cracks in the web at the top flange coping. Similar to the floor beams, the stringers commonly exhibited cracks in the web near top flange coping. Many stringers had broken rivets and cracks in the

connection angles to the end floor beams which may be related to floor beam web rotation away from the stringer (**Figure 27 and Figure 28**). Corrosion with section loss and corrosion holes were present at stringer ends, with cracks propagating outward from the corrosion holes. The floor system bracing gusset plates had pack rust up to 0.5 inch thick and corrosion holes in the gusset plates at the edge of the floor beam bottom flange and near the truss bottom chord. Corrosion holes in the bracing gussets were mostly less than 1.5 inches in diameter (**Figure 29**) but up to 12 inches long.

Figure 26. Typical Stiff Leg between Steel Pier Beam and Concrete Pier Wall

Figure 27. Corrosion of Stringers and Pier Beams

Figure 28. Sheared Rivet at Stringer-Floor Beam Connection

Figure 29. Corrosion Hole in Floor System Bracing Gusset Plate at Connection to Truss

The end spans, Span 1 and 40, consist of a steel beam superstructure with steel pier beams at piers 1 and 39 as shown in **Figure 30**. In the 2013 FC-BIR, the steel beams were rated 5 (Fair) and

the pier beams were rated 4 (Poor). The steel beams had some corrosion, primarily at the end 1-3 feet of the beams and the top flanges of exterior beams (**Figure 31**). At pier 39, connection angles between the steel beams and the pier beam were deformed, caused by pier beam rotation and sweep due to apparent thermal expansion of pavement. **Figure 32** illustrates the rotation of the pier beam, likely due to pavement expansion according to the 2013 FC-BIR. Pier beams were retrofitted with a supplemental pier beam to reduce movement, shown in **Figure 32 and Figure 33**. Bearing pads between the steel beam bottom flanges and the supplemental pier beams were twisted, and some were missing. At the abutment, exterior bearing anchor bolts were sheared.

Figure 30. North Steel Beam End Span

Figure 31. Corrosion near Beam Ends in North End Span

Figure 32. Pier Beam Rotation at South End Span and Supplemental Pier Beam

Figure 33. Supplemental Pier Beam

Railings

This bridge has two different types of railing, a concrete rail on the steel beam end spans and a metal rail on the truss spans. Both bridge rails are substandard and have not been load tested for current AASHTO standards. In Span 1, a section of the bottom rail was detached from the post and not functional (**Figure 34**), and there was damage to the concrete end post where it butted against the metal rail (**Figure 35**). Other sections of the concrete rail were cracked or spalled with exposed reinforcing steel. The metal railing also exhibited multiple locations of apparent vehicular collision damage where the railing was bent or scratched as shown in **Figure 36**.

Figure 34. Failure of Concrete Rail at South End of Bridge (Span 1)

Figure 35. Damage to Concrete Rail Due to Impact from Metal Rail

Figure 36. Collision Damage to Metal Rail

Substructure

The substructure (Item 60) had an overall condition rating of 5 (Fair) in the 2014 OS-BIR and the 2013 FC-BIR. Bridge elements associated with the substructure condition include the reinforced concrete piers and abutments. The piers received a rating of 5 (Fair) in the 2013 FC-BIR. Pier columns and web walls commonly showed both vertical and horizontal cracking, and web walls had spalls near the column connection (**Figure 37**). The 2013 FC-BIR stated the "cracks may be an indication of Alkali-Silica Reactivity" and indicated that spalls were caused by inadequate concrete cover. Foundation elements were exposed at some piers within the channel flow, which may be as-built or caused by scour. As shown in **Figure 38**, debris had gathered around some pier locations near the channel flow. Abutments received a rating of 6 (Satisfactory) in the 2013 FC-BIR. The south abutment contained cracking with some exposed rebar.

Figure 37. Typical Pier Elevation

Figure 38. Debris Buildup at Pier

2.4. Bridge "B" – Tower Bridge – US-281 over an Unnamed Creek

The existing Bridge "B", Tower Bridge, is located at an unnamed creek and consists of six 36-foot and one 50-foot steel I-beam spans, two 20-foot tower spans, and two 30-foot steel I-beam end spans. The steel I-beams in the second span from the east have been encased in concrete. Existing bridge plans are provided in **Appendix D**. The condition description of this bridge is based on the 2014 ODOT BIR in **Appendix F**.

2.4.1. Functionality

As with the Bridgeport Bridge, the deck geometry (Item 68) was rated 4 (Tolerable) in the 2014 ODOT BIR due to a sub-standard bridge width. The lack of shoulders on the deck does not meet current AASHTO or ODOT guidelines, but the rating does not qualify the bridge as functionally obsolete. Structural condition (Item 67) received a rating of 5 (Above Min Tolerable), and waterway adequacy (Item 71) received a rating of 8 (Equal Desirable), neither of which meet FHWA guidelines to be classified functionally obsolete.

The existing bridge deck only provides 24-foot clear (curb-to-curb) roadway width, consisting of two 12-foot lanes with no shoulders (**Figure 39**). Current ODOT standards for two-lane rural facilities provide a wider 40-foot clear roadway, with two 12-foot lanes and two 8-foot shoulders. Although the bridge is not classified as functionally obsolete, the existing horizontal clearance is much less than the 32-foot minimum set by AASHTO.

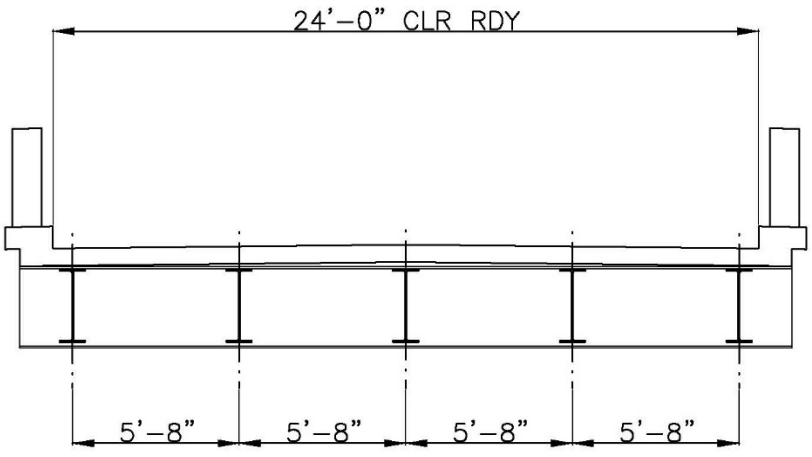

Figure 39. Typical Section of Existing Tower Bridge Superstructure

2.4.2. Structural Condition

By FHWA Guidelines listed in **Section 2.3.2**, the Tower Bridge is not considered structurally deficient. The deck, superstructure, and substructure all received ratings of 5 or greater. Structural condition and waterway adequacy were given ratings above 2. In the ODOT BIR, the Tower Bridge was given a Sufficiency Rating of 61.3 and a Health Index of 89.2.

Concrete Deck and Joints

The deck received a rating of 5 (Fair) in the ODOT BIR. The deck, shown in **Figure 40**, exhibited some cracking throughout all spans. From the item notes in the BIR, cracking was heavier in spans 6, 7, and 8. There was a concrete deck patch measuring approximately 12 square feet on the south side of the bridge at pier 10. The soffit exhibited small areas of delamination covering approximately 2-3 percent of the soffit area. From beneath the deck, approximately 0.5 inch of uplift was noted at beams 3 and 4. Expansion joints have had previous asphalt patches, but the joint seals were leaking. The fixed joints were primarily in acceptable condition; however, there was a spall evident at the easternmost joint.

Figure 40. Bridge Deck, Looking West

Figure 41. Soffit Spall Near Joint at Pier Beam

Superstructure

The superstructure, consisting of the steel beams, floor beams, fixed and expansion bearing assemblies, and bridge railings, was rated 6 (Satisfactory) in the 2014 ODOT BIR (**Figure 42**). The steel beams had heavy surface rust with some areas of pack rust and section loss, especially on the top flanges near expansion joints and on exterior beams. Floor beams were also corroded with some section loss, as apparent in **Figure 41**. Pack rust was noted on pier beams at the top of bents. Pier beam 7 was slightly distorted, 0.25 to 0.375 inches out-of-plane. The ODOT BIR noted some connection angles with cracks, including a 10-inch crack at the connection of Girder

1 to the west face of Pier Beam 5 and a possible crack in the southwest connection angle from Girder 5 to Pier Beam 7. Steel beams and floor beams had been repainted, covering some prior corrosion and possible cracking (**Figure 43**). Additionally, the concrete encasement of the second span beams may conceal degradation of the steel underneath. A view of a steel span and the single concrete encased span is shown in **Figure 44** below. The encasement around the steel beam had some spalls at the beam ends, exposing corroded steel as shown in **Figure 45**. Bearing assemblies were generally in acceptable condition; however, some fixed bearing assemblies had heavy pack rust and broken or missing anchor bolts, according to the ODOT BIR. The concrete railing had some spalled areas with exposed reinforcing steel, likely from collision damage due to the narrow bridge width.

Figure 42. Steel Superstructure

Figure 43. Connection of Floor Beam to Steel Bent

Figure 44. Steel Beam Span and Concrete Encased Steel Beam Span

Figure 45. Spalled Concrete Encasement Revealing Corroded Steel Beam End

Substructure

The substructure consists of the two namesake tower bents, four steel bents, two concrete piers, concrete abutments, and concrete footings for the steel bents and towers (**Figure 46**). The towers and steel bents exhibited areas of surface corrosion. The easternmost steel bent had been retrofitted with midpoint horizontal bracing (**Figure 47**). The adjacent steel bent was slightly misaligned with minor distortion in one leg, as noted in the ODOT BIR. The reinforced concrete piers, located at the east end of the bridge and shown in **Figure 49**, were in good condition with some staining from superstructure corrosion and transverse cracks near the top of the pier cap. The concrete cap at the easternmost pier had a spall with exposed reinforcing steel. Both abutments exhibited map cracking on the abutment face and wingwalls (**Figure 50 and Figure 51**). The east abutment contained a one-foot square spall, approximately one-inch deep, with exposed reinforcing steel located under the second beam from the south. In addition to map cracking, the west abutment had a full length transverse crack, transverse cracking in the north column, and cracks in the backwall. While header slopes at both abutments were eroded and in need of riprap, erosion at the base of the west abutment was more severe, with the bottom of the abutment web wall exposed. A gap existed between the west approach slab and the southwest wingwall, which may contribute to greater erosion at the west abutment by allowing water from the bridge deck to infiltrate the abutment at this location.

Figure 46. Bridge Elevation Showing a Typical Steel Tower (Left) and Steel Bent (Right)

Figure 47. Steel Bent with Midpoint Bracing and Vertical Stiffeners

Figure 48. West Steel Tower

Figure 49. Concrete Piers at East End of Bridge

Figure 50. Map Cracking on East Abutment Face

Figure 51. Map Cracking on North Wing of East Abutment

3.0 PURPOSE & NEED FOR U.S. 281 OVER SOUTH CANADIAN RIVER

The project need describes the transportation deficiency. It is the foundation of the entire decision-making process. The need provides information to support the purpose and explains why the project is needed.

The need for the project is as follows:

- The existing bridge (Bridge "A"; Bridgeport Bridge) is structurally deficient.
- The existing bridge is of substandard width and does not comply with current AASHTO minimum values.
- The Bridgeport Bridge and adjacent roadway segments are iconic historic features integral to the regional tourism economy.

The project purpose defines the problem (need) to be solved. Defining the purpose is necessary to determine the range of alternatives which will be considered.

The purpose of this project is as follows:

- Provide a bridge crossing that is structurally sufficient for the intended use of the structure.
- Preserve Route 66 as a tourist destination in Oklahoma.

4.0 ALTERNATIVES AND EVALUATION COMPONENTS

Three alternatives and six options were analyzed within the project extents. An impact matrix was utilized to evaluate the alternatives and options. The impact matrix and comments from stakeholders, consulting parties, and the public will be considered when identifying a preferred alternative. All of these alternatives refer to options for Bridge "A" and are described below:

- Alternative A – No Build
- Alternative B – Bridge Rehabilitation
    - Option 1 - Rehabilitation at Existing Width
    - Option 2 - Rehabilitation as a Load-Posted Historic Structure
- Alternative C – New Bridge
    - Option 1 – South Offset with Tie-In to Existing Alignment
        - A – Load-Posted Historic Structure
        - B – Bicycle and Pedestrian Historic Structure
    - Option 2 – South Offset with New Alignment
        - A – Load-Posted Historic Structure
        - B –Bicycle and Pedestrian Historic Structure
    - Option 3 – North Offset with New Alignment
        - A – Load-Posted Historic Structure
        - B – Bicycle and Pedestrian Historic Structure
    - Option 4 – Reconstruct on Existing Alignment

The goals of all of the alternatives are to improve safety over existing conditions, minimize impacts to surrounding properties and utilities, consider environmental constraints, account for constructability, and minimize construction costs. It should be noted that some of the alternatives/options impact Bridges "B" and "C". Therefore, impacts to Bridges "B" and "C" were considered in the context of the Bridge "A" alternatives/options.

The alternatives and options were evaluated based on the following components.

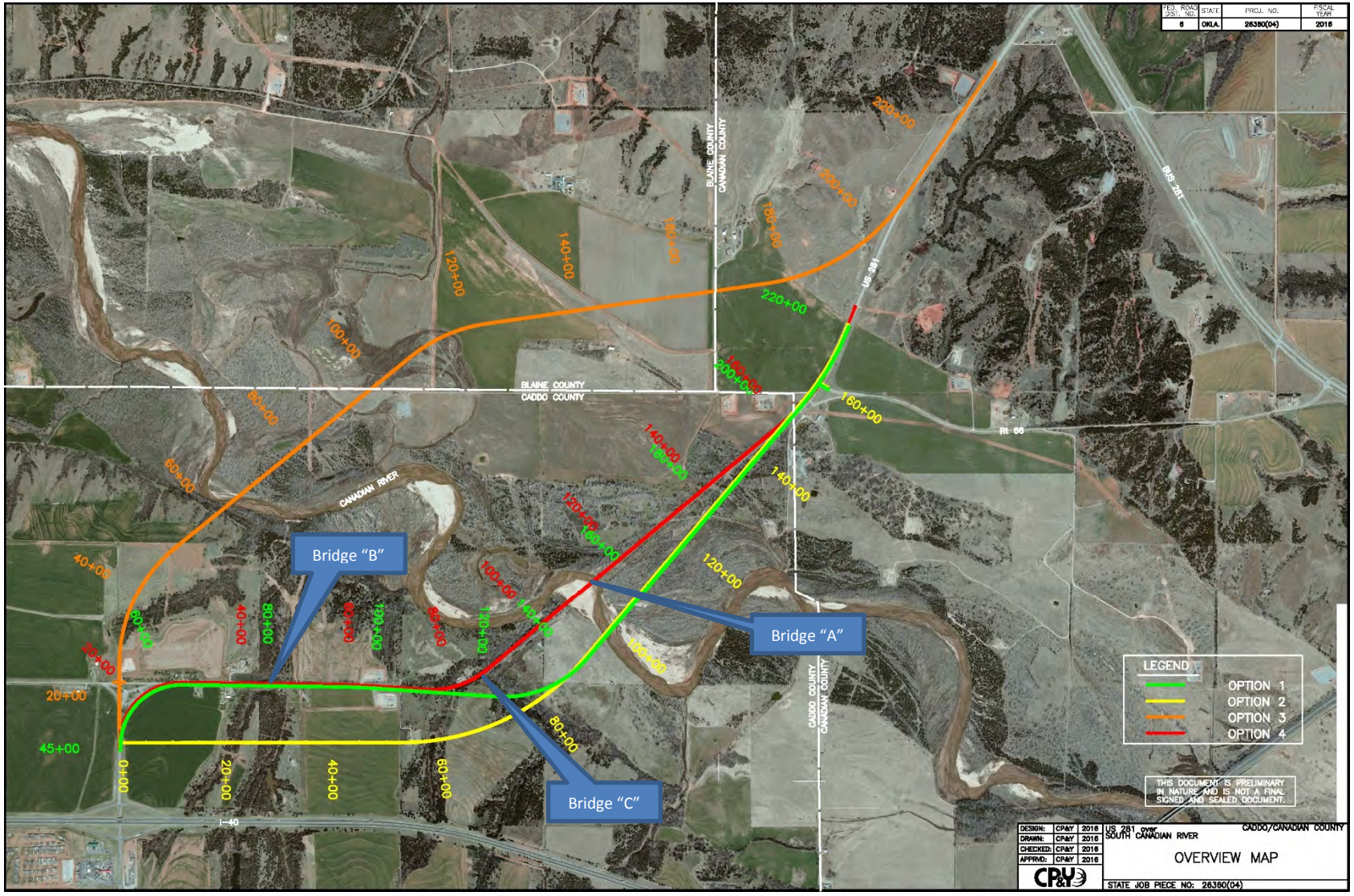

Figure 52. Illustration of Alternative C Options

Roadway

The alternatives (and options for implementing each alternative, when applicable) were evaluated based on the proposed or existing roadway facility. Analysis was focused on traveling public safety in accordance with the most recent FHWA standards and specifications. Horizontal and vertical geometry of the roadway was also included in the evaluation.

Bridge

The proposed alternatives were evaluated based on the proposed or existing bridge structure(s) with regard to capacity, structural integrity (if existing), and adherence to the most recent AASHTO and FHWA standards and specifications.

Hydrology

The proposed alternatives were evaluated based on hydrologic/hydraulic characteristics of the existing channel and drainage basins. Any new bridge structure or roadway facility crossing the South Canadian River was assessed based on its potential to affect drainage and flow of the channel.

Construction and Traffic Control

The proposed alternatives were evaluated based on the cost of construction for any new bridge structure or roadway facility or for any rehabilitation efforts. Additionally, any traffic interruption and detours, whether temporary or permanent, were also assessed and evaluated for their potential to impact current traffic. See **Appendix G** for a listing of construction cost estimates.

Right-of-Way Impacts

The proposed alternatives were evaluated based on the cost of right-of-way acquisition (estimated cost per acre of acquired land plus relocation costs). See **Appendix I** for a listing of right-of-way cost estimates.

Utility Impacts

The proposed alternatives were evaluated based on the presence of existing utilities and any costs associated with relocating them. In the case of a rehabilitation to the bridge, utilities that had previously been attached to the bridge would likely need to be relocated. In the event of a new roadway facility or bridge structure, utilities would likely need to be relocated. See **Appendix C** for a listing of utility relocation cost estimates.

Environmental Impacts

The study area (**Figure 52**) encompasses the area surrounding the various alternatives. It was created to map and identify the environmental conditions that could be affected by the project.

The South Canadian River within the study area contains critical habitat for the Arkansas River shiner (*Notropos girardi*). The critical habitat extends up to 300 feet on either side of the river banks. According to the U.S. Fish and Wildlife Service National Wetland Inventory maps, there are large areas of potential wetlands alongside the river and its drainages, as well as several potential ponded areas. Impacts to these wetlands would likely require a 404 permit from the U.S. Army Corps of Engineers and could potentially require mitigation.

Oil and gas well locations within the study area were mapped, as well as groundwater and monitoring wells. Potential hazardous waste sites within and in the vicinity of the study area were also obtained in order to determine if any of the alternatives would be affected by hazardous waste issues.

Historic/Section 4(f) Impacts

The Bridgeport Bridge is individually eligible for listing in the NRHP, and is listed as a contributing feature in the NRHP-listed Bridgeport Hill-Hydro Route 66 Segment Historic District. It is a highly significant Route 66 bridge structure and is arguably the most historic bridge in the state of Oklahoma. All features along this section of US-281 (including Bridges “B” and “C”) are also considered contributing features to the Historic District and are historically significant. Each alternative has been assessed for its potential to impact these significant historic resources and to be considered a 4(f) use.

Qualitative Economic Impact Analysis

A qualitative economic impact analysis has been conducted for potential impacts associated with each alternative. This analysis is high-level and considers general impacts to economic activity resulting from each alternative. The scope of this analysis does not include a quantitative analysis, specific dollar amounts, or impacts to individual businesses or business groups. The intent of this qualitative analysis is to provide a relative impact on economic activity by comparing the alternatives.

The major economic generators in the study area are oil and gas exploration, agriculture, and tourism, which also correspond with the top three economic generators in the state of Oklahoma.

Oil and gas exploration is the largest economic generator in the three counties represented in this project area (Oklahoma Department of Commerce). The use of heavy trucks is common in oil

and gas exploration, and therefore potential impacts to truck routes are assessed for each alternative.

Agriculture (specifically the production of wheat) is the second largest economic generator for the three counties represented in this project area (Canadian, Caddo, and Blaine). In 2014 and 2015, the three counties accounted for approximately 13.4 and 11.1 percent, respectively, of the total wheat production for the state of Oklahoma (Oklahoma Department of Agriculture National Agricultural Statistics Service). Heavy trucks and farm implements routinely use the Bridgeport Bridge to transport products and equipment to and from area farms and markets, so these will be considered for each alternative.

According to the Oklahoma Department of Tourism, in 2012 alone the travel industry (consisting of seven main categories of travel-related industry and a total of 34 officially recognized industry classifications and sub-classifications under the National Industry Classification [NAICS] Code) infused almost eight billion dollars into the Oklahoma economy from out of state and international travelers. Canadian County is ranked eighth in the state for tourism dollars generated, largely due to Route 66 roadway segments and their associated features and destinations within the county (Oklahoma Department of Tourism). Locals and tourists often use the bridge and roadway facility for bicycling and pedestrian travel, but another common method of travel along the segments of Route 66 is by recreational vehicle (RV) and automobile (Oklahoma Route 66 Association). Maintaining access to the bridge and the associated roadway is a component of the purpose and need for the project, as the Bridgeport Bridge and associated roadway segments are iconic historic features that are integral to the regional tourism economy. Therefore, potential tourism impacts have been assessed for each alternative.

5.0 ALTERNATIVES ANALYSIS

This section of the report presents the different alternatives (and various options for implementing the alternatives) to improve this segment of US-281 and the design criteria and components used to evaluate each alternative. The basic purpose is to provide a bridge that is structurally sufficient for US-281 as it crosses the South Canadian River and to preserve Route 66 as a tourist destination in Oklahoma. To accomplish this there are several other factors that need to be considered. These evaluation components, discussed in the previous section (**Section 4.0**), include roadway and bridge geometry, hydrology/hydraulics, construction and traffic control, right-of-way impacts, utility impacts and relocation, environmental constraints, historic or 4(f) constraints, and general economic impact.

5.1. Design Criteria

The design criteria selected for this study was assembled from the following publications:

- *"A Policy on Geometric Design of Highways and Streets,"* ("*AASHTO Green Book"*), AASHTO 2011
- *"LRFD Bridge Design Specifications,"* AASHTO 2014
- *"Oklahoma Department of Transportation Roadway Design Manual,"* July 1992
- *"Roadside Design Guide,"* AASHTO 2011
- *"ODOT Standard Construction Specifications,"* 2009
- *"ODOT Construction Standard Drawings",* Latest Revision

According to ODOT's Rural Functional Class Map (RFC) for Caddo and Canadian County, US-281 is a Rural Minor Arterial. Guidance for the design criteria for US-281 was developed from the Design Criteria Table 12-3 of the ODOT Roadway Design Manual in addition to the other publication sources listed.

- Design Speed: 65 MPH
  (ODOT Roadway Design Speed Memo)
- Maximum Superelevation: 8%
  (AASHTO Green Book, Minimum Radii for Design Super Rates, emax=8%, Table 3-10b)
- Minimum Vertical Curve K-Values: KCREST = 193, KSAG = 157
  (AASHTO Design Control for Vertical Curves, Table 3-34 and Table 3-36)
- Current AADT: 1,400 VPD
- Design AADT (2039), US-281: 2,100 VPD
  (ODOT Traffic Division)
- Clear Zone: 30 feet with 1:6 side-slopes
  (AASHTO Roadside Design Guide Clear-Zone Distances, Table 3-1)
- Maximum Allowable Grade: 5%

(ODOT Roadway Design Manual, Table 12-3)

- Terrain Type: "Rolling"
  (ODOT Roadway Design Manual, Table 12-3)
- Roadway Typical Section: Two 12- foot lanes with 8 foot paved shoulders
  (ODOT Roadway Design Manual, Table 12-3)

5.2. Alternative A – No Build

General Description

Under the No Build alternative, a new bridge would not be constructed. The existing US-281 Bridge over the South Canadian River would remain in the same configuration and would continue to be maintained and inspected on the standard schedule by ODOT. Truck traffic (over five tons) would be removed from the bridge and rerouted, but all other existing traffic would continue to use the bridge. No improvements other than normal maintenance and repairs would occur within the project area. See **Table 3** for summary of evaluation components considered for this alternative.

Roadway

There would be no improvement to the roadway geometry under the No Build alternative. This alternative would leave 6 existing vertical curves that do not meet current design standards in place. The existing roadway width of 18’ with no shoulders would be left in service.

Bridge

The No Build alternative would not address the safety concerns associated with the narrow bridge. Further, this alternative would not address the structural deficiencies of the bridge, and would prolong the inevitable and potentially costly repairs.

The continued deterioration and potential for damage from vehicle collisions would compromise the safety and function of the crossing, which could result in failure of the bridge in the near future. Assuring the sustainability and quality of the crossing would be better served by advanced planning and maintenance as opposed to emergency response at the end of the functional life of the bridge.

Hydrology

There would be no impact to the hydrology of the South Canadian River, as the bridge has been in place for over 80 years and channeling and flood control efforts upstream have been taking place since before the bridge was constructed in 1933.

Construction and Traffic Control

As there would be no construction activity on the bridge and roadway, there would be no construction costs (aside from continued general maintenance and repair work on the bridge). Truck traffic and vehicles weighing more than five tons would be restricted from using Bridge "A" (the Bridgeport Bridge), though all other traffic would continue to use the facility.

Right-of-way Impacts

There would be no right-of-way impacts as there would be no right-of-way acquired under the No Build alternative.

Utility Impacts

There would be no impacts to utilities as there would be no relocations associated with the No Build alternative. However, the AT&T and Hinton Telephone fiber optic lines, which are currently attached to the bridge, would have to be relocated if the structural integrity of the bridge is compromised in the future.

Environmental Impacts

Under the No Build alternative, there would be no impacts to Arkansas River shiner critical habitat, wetlands, waters, oil/gas wells, or potential hazard waste sites.

Historic/Section 4(f) Impacts

With the No Build alternative, there would be no impact to the historic bridge or any structures associated with the historic roadway and therefore no 4(f) use. However, the No Build alternative does not address the structural deficiencies of the bridge, and continual use of the bridge could further the deterioration of the bridge and roadway. Collisions along the narrow bridge would continue to damage the bridge truss members, potentially beyond feasible repair. Likewise, the natural deterioration of the bridge caused by the stress of heavy traffic could cause the end of the bridge's functional life altogether, which could result in a total loss of the historic bridge.

Qualitative Economic Analysis

With the No Build alternative, the highly historic bridge and roadway would remain the tourist draw that it has been historically. The detour of heavy trucks off of the bridge under this alternative could affect the three largest economic generators of the area including oil and gas exploration, agriculture, and tourism. The detour would include use of I-40 and the US-281 Spur, representing a total detour of approximately 13 miles, which would not likely have a major

impact on productivity for oil and gas exploration or agriculture. However, the removal of RV traffic (over five tons), associated with tourism, from this route and the bridge could impact travel routes and deter tourists from this area. A large part of the allure of the bridge is the ability to drive along it, as its massive length and scale and integrity of feeling and association with historic Route 66 are important factors that make it a travel destination in the state and beyond. But ultimately, the prolonged life of the bridge due to the five-ton load-posting would be considered to have a positive impact on Route 66 tourism.

Additionally, in the event of the bridge's failure to function due to continued deterioration and/or damage attributed to the substandard width of the bridge, the loss of the historic bridge would have a major impact on regional tourism and the travel industry. There would be an impact to travel patterns that tourists would take, not only due to the bridge being impassable but also the loss of the monumental destination of the bridge itself. This could have impacts on where tourists decide to stop for food, gas, and lodging (major contributors to the economic benefit of tourism travel), how long they decide to stay in the area, and whether they choose to venture to the area at all.

Table 3. Alternative A - No Build Summary

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	No
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs	Construction Cost	$0
	ROW Cost	$0
	Utility Cost	$0
	TOTAL PROJECT COST	**$0**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	None
	NWI Wetlands and Ponds	None
	NWI Riverine Areas	None
	Historic/Section 4(f) Impacts	No 4(f) use; Continued damage to historic bridge likely
	Qualitative Economic Impacts	Bridge failure, if it occurred, would have detrimental impact to tourism

5.3. Alternative B – Bridge Rehabilitation

5.3.1. Option 1 – Rehabilitation at Existing Width

General Description

Under this alternative, Bridge "A" would be rehabilitated at the existing width, in accordance with the Secretary of the Interior's Standards for Rehabilitation as outlined by AASHTO NCHRP Project 25-25, Task 19 (from March, 2007). No new structures would be constructed, nor any new roadway facility. All existing traffic would continue to be permitted to use the bridge structures, including standard trucks (no oversized or overload permit vehicles). Bridge "B" rehabilitation or replacement will be completed under a separate contract. Bridge "C" would not be impacted under this alternative, and is not discussed. See **Table 4** for summary of evaluation components considered for this alternative.

Roadway

There would be minimal improvement to the roadway geometry under this alternative. This alternative would leave six existing vertical curves that do not meet current design standards in place. The existing 18-foot wide roadway with no shoulders would be left in service.

Bridge

The bridge would be rehabilitated according to the Secretary of the Interior's Standards as outlined by AASHTO NCHRP Project 25-25, Task 19. The rehabilitation would take into account the historic nature of the bridge, with repairs and replacements taking care to preserve the historic fabric of the bridge by using like and kind materials, when possible.

Bridge "A" – Bridgeport Bridge – US-281 over the South Canadian River

A load rating analysis was performed to determine how the existing truss members and gusset plates respond to current AASHTO truck loading requirements. A load rating of 1.00 or greater is considered to be sufficient for the structural component to safely carry load. The inventory rating is that load, including loads in multiple lanes, "which can safely utilize an existing structure for an indefinite period of time" (AASHTO 2011). The operating rating is an indicator of the maximum live load (trucks, passenger vehicles, pedestrians) a bridge can withstand, including multiple loaded lanes. Unlimited use of the bridge at the operating rating level will shorten the bridge lifespan. For this report, the inventory and operating ratings will be used to determine the extents of repair needed for each alternative. Detailed calculations for the individual inventory and operating load rating values for each truss member and gusset plate is provided in **Appendix L**.

Each truss span consists of a concrete deck driving surface, supported by steel stringers and floor beams that are connected to a steel truss unit on each side of the deck. All of the truss members are attached to each other and the floor beams by steel gusset plates (See **Figure 53**).

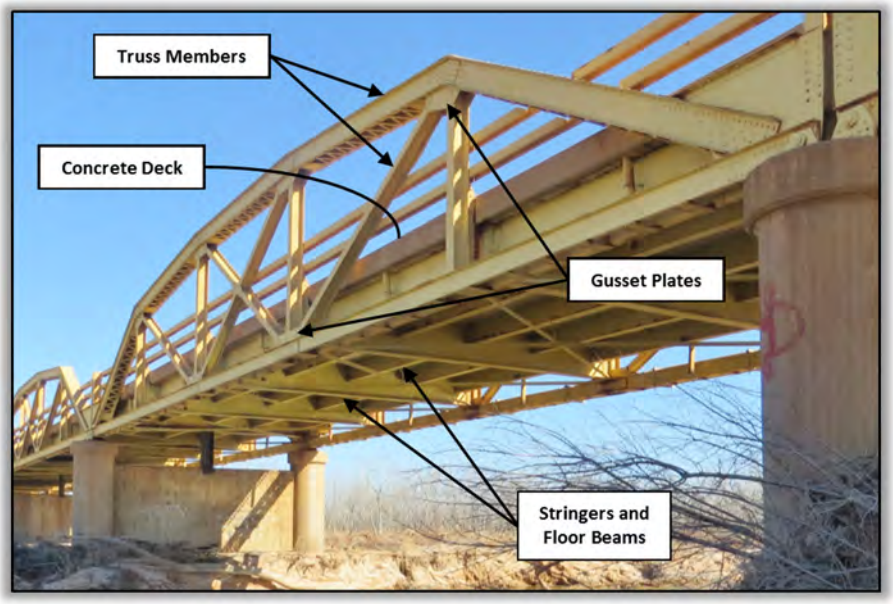

Figure 53. Superstructure Components

Each truss unit is comprised of 18 members for a total of 36 truss members per span. The load analysis for current AASHTO truck requirements resulted in a total of 12 members (6 per side) that exhibited an inventory rating of 1.00 or greater and 18 members (9 per side) with an operating rating of 1.00 or greater. A total of 24 members of each span would require additional strengthening to carry full truck loading indefinitely. Rehabilitation would include attaching additional structural plates to all of the top and bottom chord members, along with full replacement of 4 of the 8 diagonal members.

The gusset plates have inventory ratings between 0.14 and 0.51, which indicates that the existing gusset plates would not be capable of carrying the design truck loads for an indefinite period of time, based on current AASHTO and FWHA specifications. Gusset plates would need to be replaced with thicker and/or higher strength steel plates, replacing riveted connections with new bolts.

Per the AASHTO *Guidelines for Historic Bridge Rehabilitation and Replacement,* truss members may be replaced in kind with stronger material. However, if the majority of the bridge would be rebuilt and not rehabilitated, much if not all historic fabric and character-defining features would be compromised. This would result in an adverse effect to the historic bridge.

In addition to the primary truss members, the load-carrying steel floor beam and stringer system would require rehabilitation. The 2013 F-BIR and 2014 OS-BIR detail cracks in stringer coping, stringer connections, and floor beams. Also included in these reports are areas of section loss to floor beams and stringers and locations of missing stringer rivets. The existing stringers have inventory and operating ratings of 0.69 and 0.89, respectively. The existing stringers would need to be replaced with new beams of similar size. The increased steel strength of the new beams would ensure new load ratings greater than 1.00 and address the corrosion of the existing stringers. These new beams would be slightly lighter than the existing stringers and would not increase the dead load distributed to the substructure elements. The end floor beams have an inventory rating of 3.44 and operating rating of 4.46 when modeled with the stiff-leg support struts installed at the midpoint of each pier beam. This load rating does not account for any reduction in capacity due to section loss or cracking noted in the inspection reports. The capacity of the floor beam can decrease to 33% of the original capacity without load ratings dropping below 1.00. The interior floor beams have inventory and operating ratings of 0.51 and 0.67, respectively. Similarly to the stringers, the existing interior floor beams would be replaced with new, stronger, and lighter beams of similar depth to increase the load rating above 1.00.

For all spans, the existing deck would be removed and replaced. The concrete rails on the end spans would also be removed and replaced with new, context-sensitive, load-tested traffic rails. According to AASHTO Guidelines, decks and standard-design rails are not vital to maintain historical integrity of a structure. The metal rails of the truss spans would be cleaned and painted. Some sections of metal rail with severe collision damage may be replaced in kind.

Rehabilitation to the concrete piers and abutments would also be needed to prevent them from dropping below the current overall substructure condition rating of 5 (Fair). All substructure elements would be cleaned, and debris would be removed from pier locations. Cracks should be sealed with epoxy resin. Unsound concrete would be removed and spalls patched.

Bridge "B" – Tower Bridge – US-281 over an Unnamed Creek

The Tower Bridge will not be rehabilitated with this Alternative. It is anticipated that the Tower Bridge will be replaced or rehabilitated on a different contract and would require separate Section 4(f) analysis.

Hydrology

There would be no impact to the hydrology of the South Canadian River, as the bridge has been in place for over 80 years and channeling and flood control efforts upstream have been taking place since before the bridge was constructed in 1933.

Construction and Traffic Control

During construction, this alternative would require the existing road to be closed and traffic rerouted on a detour. The detour would follow along I-40 on the south, then along the US-281 spur on the east. This detour would be approximately 13 miles long. There would be no temporary widening needed with this option. The construction cost estimate for this option is $21,710,000 (**Appendix G**).

Right-of-Way Impacts

There would be no right-of-way impacts as there would be no right-of-way acquired under this alternative.

Utility Impacts

AT&T and Hinton telephone both have a fiber optic line hung on the existing bridge. Under this alternative it has been estimated that these utilities would need to be relocated. The utility relocation estimate for this option is $200,000. See **Appendix C** for preliminary utility relocation estimate details.

Environmental Impacts

Environmental impacts are expected to be limited to approximately 50 feet on either side of the existing US-281 centerline (100 feet wide total) due to the construction of temporary roads and maneuvering of construction equipment necessary to complete the bridge rehabilitation. It has been calculated that approximately 0.03 acres of NWI wetlands, 0.5 acres of NWI riverine areas, and 1.6 acres of critical habitat for the Arkansas River shiner would be impacted (temporarily or permanently) by this bridge rehabilitation option.

Historic/Section 4(f) Impacts

As mentioned previously, the bridge rehabilitation would comply with the Secretary of the Interior's Standards for historic bridge rehabilitation, and therefore it is unlikely that there would be a Section 4(f) use of the bridges or associated roadway through rehabilitation. However, allowing heavy truck traffic on the narrow bridge would continue to contribute to the deterioration and damage of the bridge, potentially leading to a loss of the historically significant bridge.

Qualitative Economic Analysis

The rehabilitation of the structure would result in a bridge that remains in service for at least another 20 years (barring any catastrophic events that result in failure of the bridge), which would be an improvement over the current plan of general maintenance and repairs as needed. Though the bridge would be closed for a period of time during the actual rehabilitation work, it would be reopened and in better condition for continued use by tourists and local traffic. The timing of the rehabilitation work should be considered, as spring and summer are the peak times for local, out of state, and international travelers to visit Route 66 destinations. This rehabilitation alternative would continue to allow heavy truck traffic, which would allow traffic associated with oil and gas exploration, agriculture, and tourism to continue to traverse the bridge. While this would be an economic benefit, the continued deterioration and damage to the bridge by the heavy truck traffic must also be considered as a threat to the bridge's life span more so than the No Build alternative, which would establish a five-ton load limit for the bridge.

Table 4. Alternative B, Option 1 Summary

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs	Construction Cost	$21,710,000
	ROW Cost	$0
	Utility Cost	$200,000
	TOTAL PROJECT COST	**$21,910,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	1.6 ac
	NWI Wetlands and Ponds	0.03 ac
	NWI Riverine Areas	0.5 ac
	Historic/Section 4(f) Impacts	-No 4(f) use of bridge; -Rehab per SOI Standards
	Qualitative Economic Impacts	-Rehab of bridge would prolong life span -Continued use by heavy truck traffic is threat to structure and its role in tourism

5.3.2. Option 2 – Rehabilitation as a Load-Posted Historic Structure

General Description

Under this alternative, Bridge "A" would be rehabilitated at the existing width, in accordance with the Secretary of the Interior's Standards for Rehabilitation as outlined by AASHTO NCHRP Project 25-25, Task 19 (from March, 2007). No new structures would be constructed, nor any new roadway facility. Heavy truck traffic would be diverted from the bridge under this option, but existing passenger traffic (less than five tons) would continue to use them. Bridge "B" rehabilitation or replacement will be completed under a separate contract. Bridge "C" will not be impacted under this alternative, and it is not discussed. See **Table 5** for summary of evaluation components considered for this alternative.

Roadway

There would be minimal improvement to the roadway geometry under this alternative. This alternative would leave six existing vertical curves that do not meet current design standards in place. The existing 18-foot wide roadway with no shoulders would be left in service.

Bridge

The bridges would be rehabilitated according to the Secretary of the Interior's Standards for historic bridges. The rehabilitated bridges would then be closed to heavy truck traffic while continuing to permit passenger vehicles to travel on the bridges. Heavy trucks would be detoured approximately 13 miles, via I-40 to the south and the US-281 Spur. For load rating calculations in this option, a maximum five-ton truck was used, modeled with a 2,000 pound front axle load and an 8,000 pound rear axle load. In order to match the AASHTO LRFD methodology, the 640 pound per linear foot lane load was included.

Bridge "A" – Bridgeport Bridge – US-281 over South Canadian River

With reduced load from limiting truck traffic, load ratings for all truss members were greater than 1.00. Inventory ratings ranged from 1.73 to 12.76, and operating ratings ranged from 2.24 to 16.54. These load ratings do not take into account reduction in strength due to cracking, corrosion, distortion of members, or any other damages to the truss. It is recommended that areas of severe damage on the truss be repaired in accordance with Secretary of the Interior's Standards. These repairs may include additional steel plates bolted to the truss members or complete replacement in kind if necessary.

The gusset plates have inventory ratings between 0.45 and 1.29 based on the five-ton truck loading. Six of the eight gusset plates would need to be replaced with higher strength steel plates, replacing riveted connections with high-strength bolts.

As expected, the load rating of the stingers and floor beams for the bridge as a load-posted structure with a five-ton truck limitation resulted in higher load ratings. The stringers had inventory and operating ratings of 2.03 and 2.63, respectively. The stringers are adequate for a decrease in strength to 59% of the original capacity due to section loss and cracks noted in the inspection reports. End Floor Beams were analyzed without the stiff-leg retrofit supports and have inventory and operating ratings of 2.84 and 3.68, respectively; load ratings will remain adequate for a decrease in strength to 66% of the original capacity. The inventory and operating ratings of the interior floor beams are 3.39 and 4.39. With as low as 55% of their original capacity, interior floor beams will still have load ratings greater than 1.00. Cracks and areas of section loss noted in the Inspection Reports should be strengthened, and missing rivets should be repaired. All steel stringers and floor beams should be cleaned and painted to deter future corrosion.

For all spans, the existing deck would be removed and replaced. The concrete rails on the end spans would also be removed and replaced with new, standard, load-tested rails. The metal rails of the truss spans would be cleaned and painted with severely damaged sections of metal rail being replaced in kind.

As in Option 1, all substructure elements would be cleaned and debris would be removed from pier locations. Cracks would then be sealed with epoxy resin, unsound concrete removed, and concrete spalls patched.

Bridge "B" – Tower Bridge – US-281 over an Unnamed Creek

The Tower Bridge will not be rehabilitated with this Alternative. It is anticipated that the Tower Bridge will be replaced or rehabilitated on a different contract and would require separate Section 4(f) analysis.

Hydrology

There would be no impact to the hydrology of the South Canadian River, as the bridge has been in place for over 80 years and channeling and flood control efforts upstream have been taking place since before the bridge was constructed in 1933.

Construction and Traffic Control

During construction this alternative would require closing the existing road, and rerouting traffic on a detour. The detour would follow along I-40 on the south, then along the US-281 spur on the

east. This detour is approximately 13 miles long. There would be no temporary widening needed with this option. The construction cost estimate for this option is $11,305,000 (**Appendix G**).

Right-of-Way Impacts

There would be no right-of-way impacts as there would be no right-of-way acquired under this alternative.

Utility Impacts

AT&T and Hinton Telephone both have a fiber optic line hung on the existing bridge. Under this alternative it has been estimated that these utilities would need to be relocated. The utility relocation estimate for this option is $200,000. See **Appendix C** for preliminary utility relocation estimate details.

Environmental Impacts

As with Option 1, environmental impacts under Option 2 are expected to be limited to approximately 50 feet on either side of the existing US-281 centerline (100 feet wide total) due to the construction of temporary roads and maneuvering of construction equipment necessary to complete the bridge rehabilitation. Approximately 0.03 acres of NWI wetlands, 0.5 acres of NWI riverine areas, and 1.6 acres of critical habitat for the Arkansas River shiner could be impacted (temporarily or permanently) by this bridge rehabilitation option.

Historic/Section 4(f) Impacts

As mentioned previously, the bridge rehabilitation would comply with the Secretary of the Interior's standards for historic bridge rehabilitation, and therefore it is unlikely that there would be a Section 4(f) use of the bridge or associated roadway through rehabilitation.

Qualitative Economic Analysis

The rehabilitation of the structure would result in a bridge that remains in service for at least another 20 years (barring a catastrophic event that would cause the failure of the bridge), which would be an improvement over the current plan of general maintenance and repairs as needed. Though the bridge would be closed for a period of time during the actual rehabilitation work, it would be reopened and in better condition for continued use of tourists and local traffic. The timing of the rehabilitation work should be considered, as spring and summer are the peak times for local, out of state, and international travelers to visit Route 66 destinations.

The removal of heavy truck traffic from the bridge structure is considered a benefit for the prolonged life of the bridge; however it is currently used by vehicles representing the major industries in the area including oil and gas exploration, agriculture, and tourism. The relatively short detour that would be put in place using I-40 and the US-281 Spur, representing a total detour of approximately 13 miles, would not likely have a major impact on productivity for oil and gas exploration or agriculture. However, the prohibition of RV traffic (over five tons) along the bridge, related to tourism, could impact travel routes and be a deterrent for travelers to the area. A large part of the allure of the bridge is the ability to drive along it, as its massive length and scale, along with its integrity of feeling and association with Route 66 are important factors that make it a travel destination within the state and beyond. Ultimately, the prolonged life of the bridge due to the five-ton load-posting would be considered to have a positive impact on Route 66 tourism.

Table 5. Alternative B, Option 2 Summary

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs	Construction Cost	$11,305,000
	ROW Cost	$0
	Utility Cost	$200,000
	TOTAL PROJECT COST	**$11,505,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	1.6 ac
	NWI Wetlands and Ponds	0.03 ac
	NWI Riverine Areas	0.5 ac
	Historic/Section 4(f) Impacts	-No 4(f) use of bridge -Rehab per SOI Standards
	Qualitative Economic Impacts	-Detour of heavy truck traffic could be detriment to main economies of area -Diminished threat of continued damage and deterioration of the bridge by the heavy trucks is positive

5.4. Alternative C – New Bridge

5.4.1. Option 1 – South Offset with Tie-In to Existing Alignment

General Description

Load-Posted Historic Structure

Option 1 alignment begins at approximately 1,300 feet north of the I-40/US-281 junction and proceeds northeasterly for approximately 3.3 miles to a location north of Jones Road (Historic US 66). This alignment is offset approximately 1,000 feet south of the existing Bridge "A" (Bridgeport Bridge) at the south abutment. This option would leave the existing Bridge "A" structure in place, load posted, and accessible to passenger vehicles (five-ton limit) only. Bridge "A" would be rehabilitated for passenger vehicle traffic and small trucks to address the structural deficiency of the bridge to a five-ton weight limit.

This option follows on the existing alignment from Sta. 45+00 to 110+00, and the reasonable and foreseeable outcome would require reconstruction of Bridge "B" (Tower Bridge) on existing alignment. Bridge "C" would be left in place under this option. The construction, utility, and R/W costs have been calculated separately for the Bridge "A" segment (Sta. 100+00 to 221+57) and Bridge "B" segment (Sta. 44+90 to Sta. 100+00). Separating these two segments for the estimate conforms to the current ODOT plan to construct these projects in separate contracts/years. In order to provide an appropriate, overall cost comparison of the various alternatives and options, these segments will be reported together within this report. See **Table 6** for summary of evaluation components considered for this alternative.

Bicycle and Pedestrian Historic Structure

This option has the same general description as the load-posted historic structure with the exception that Bridge "A" (Bridgeport Bridge) would be limited to bicycle and pedestrian traffic only. No vehicles would be allowed on the historic bridge. Bridge "A" would be rehabilitated for pedestrian traffic to address the structural deficiency and the required modifications to become a pedestrian bridge. A small parking area on each side of the bridge and bollards to prevent bridge access to vehicular traffic would be included with this option.

Roadway

Load-Posted Historic Structure

The typical section would have a clear roadway width of 40'-0" and consist of two 12' travel lanes with 8' shoulders. Option 1 would include four horizontal curves. The first curve (Sta. 45+79 to

Sta. 63+88) would have an 11,400-foot radius and a superelevation rate of 7.8 percent, based on a maximum value of 8 percent. This curve meets a 55 mph design and is currently posted at 55 mph and would need to remain as such.

The second curve (Sta. 93+65 to Sta. 100+00) has an 11,459-foot radius and would require reverse crown to meet a 65 mph design. The third curve (Sta. 122+84 to Sta. 142+19) would have a 2,070-foot radius and a superelevation rate of 7.2 percent, based on a maximum value of 8 percent. The roadway would transition back to a normal crown section before reaching the proposed Bridge "A". The last horizontal curve (Sta. 212+19 to Sta. 219+79) would tie into the existing alignment on the northeast side of the project, consist of a 5,010-foot radius, and have a superelevation rate of 3.6 percent. The proposed alignment would then end where the roadway section transitions back to a normal crown. This option would be designed to cross the existing US-281 centerline at Sta. 200+70 in order to avoid impacts to the historic Route 66 pavement along Jones Road.

The proposed profile would be designed to meet a 65 mph design speed. The profile would require a cut through an existing hill from Sta. 115+00 to Sta. 123+00 with a maximum depth of approximately 24 feet. The vertical profile across the floodplain would be set to closely follow the existing US-281 profile grade. The maximum fill height along the profile would 14 feet. The profile would improve all of the existing vertical curves that are deficient based on the design speed.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure. Additionally, a small parking area on each side of the bridge and bollards to prevent bridge access to vehicular traffic would be included with this option, estimated to cost $200,000.

Bridge

Load-Posted Historic Structure

Option 1 would require the construction of a new bridge over the South Canadian River on a south offset, leaving Bridge "A" (Bridgeport Bridge) in place as a load-posted structure. The new alignment would be offset from the Bridge "A" south abutment by approximately 1,000 feet while the offset from the north abutment would be approximately 300 feet. The new bridge is estimated to be 39 100-foot prestressed concrete (PC) beam spans with a clear roadway width of 40 feet and new load-tested TR-4 traffic rails. Bridge "A" would be rehabilitated for passenger vehicle traffic and small trucks to address the structural deficiency of the bridge, as detailed in Section 5.3.2 of this report. Bridge "A" would remain substandard width but have reduced traffic.

Bridge "B" (Tower Bridge) would include reconstruction in the same location, which may be completed under a separate contract. The new bridge is estimated to be 4 100-foot PC beam spans with a clear roadway width of 40 feet and TR-4 traffic rails. The new structure would require piers over 50' feet in height. Option 1 would include the construction of a new RCB culvert, downstream from the existing Bridge "C", along the new alignment over the crossing of an unnamed tributary to the South Canadian River. The structure is estimated as a double-cell 10'x8' RCB culvert that would be 140 feet long.

Bicycle and Pedestrian Historic Structure

Bridge "A" improvements would include painting of the existing steel components and replacement of the bridge deck. A limited number of steel members and gusset plates would need to be replaced only in locations of collision damage and excessive corrosion. Additional railing would be attached between and above the existing railing in order to retrofit the bridge for pedestrian and bicycle safety. After Bridge "A" is rehabilitated and painted, the only maintenance for this bridge would be to keep the pavement clear of vegetation and debris. Applying salt to the deck surface during winter snow and ice storms would no longer be required or recommended. Inspections of the bridge condition would be less frequent if vehicular traffic is removed. The existing width of the bridge is acceptable for bicycle and pedestrian use.

Hydrology

Load-Posted Historic Structure

Based on preliminary analysis, Bridge "A" (Bridgeport Bridge) is not a major restriction to the water surface profile of the South Canadian River. Therefore, a new bridge to carry the proposed US-281 alignment would be of similar length and low chord elevation. A new structure, to be constructed on the new alignment downstream from the existing Bridge "C", would likely be a double-cell 10'x8' RCB culvert based on the existing terrain. The new structures would be sized to produce no detrimental hydraulic impacts to the existing bridges. A preliminary analysis of the hydrologic and hydraulic conditions was performed by Meshek and Associates and can be found in **Appendix H**.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Construction and Traffic Control

Load-Posted Historic Structure

The roadway would remain open during the construction period for Bridge "A" (Bridgeport Bridge). Temporary widening of the existing pavement would be required at both tie-in locations to allow the road to remain open. A temporary detour of approximately 800 feet would need to be constructed where the proposed road crosses the existing US-281 alignment. This temporary widening would provide adequate space for the construction of the entire 40-foot roadway section. The proposed bridge and the majority of the roadway could be constructed without affecting the existing traffic. This option would require the closure of US-281 for the construction of Bridge "B" (Tower Bridge). The detour route would follow along I-40 on the south, then along the US-281 spur on the east. This detour would be approximately 13 miles long. The construction estimate for this option is $46,005,000 which includes Bridge "A" at $27,065,000, Bridge "A" rehabilitation to a load-posted structure at $11,305,000, and Bridge "B" reconstruction at $7,635,000 (**Appendix G**).

Bicycle and Pedestrian Structure

Same as Load-Posted Historic Structure with the additional cost for construction of parking facilities and a different cost for rehabilitation to the existing Bridge "A". The construction estimate for this option is $42,870,000 which includes Bridge "A" at $27,065,000, parking at $200,000, Bridge "A" rehabilitation to a bicycle and pedestrian structure at $7,970,000, and Bridge "B" reconstruction at $7,635,000 (**Appendix G**).

Right-of-Way Impacts

Load-Posted Historic Structure

Option 1 would require additional right-of-way that impacts 16 parcels. The estimated amount of right-of-way needed for this alternative would be 47.24 acres. No relocations would be anticipated with Option 1. The right-of-way estimate for this option is $380,000. See **Appendix I** for right-of-way estimate details.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Utility Impacts

Load-Posted Historic Structure

Multiple utilities are located within the existing alignment and two communication lines are located on Bridge "A". Many of these would need to be relocated due to the construction limits of this option. Hinton Telephone has a line that would need to be relocated on the south side of US-281 from Sta. 44+90 to 105+78, and has crossings at Sta. 105+96 and 198+23. AT&T has a fiber optic line crossing at Sta. 116+01. Dobson Technologies has a fiber optic line crossing at Sta. 122+84. Pioneer Telephone has a line from Sta. 208+65 to 221+57 that would need to be relocated. Caddo Electric has approximately 2,800 feet of a three-wire parallel line and four overhead crossings in the project limits. EnLink Midstream has two 10.75-inch gas crossings at Sta. 119+20 and 203+78, one 24" crossing at Sta. 85+14, and a 4.5" crossing at Sta. 98+40. Mustang Fuel has a 6-inch gas line crossing located at Sta. 132+50. The utility relocation estimate for this option is $1,060,000 which includes Bridge "A" (Bridgeport Bridge) at $505,000 and Bridge "B" (Tower Bridge) at $555,000. See **Appendix C** for preliminary utility relocation estimate details.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Environmental Impacts

Load-Posted Historic Structure

Option 1 would result in approximately 4.7 acres of impacts to Arkansas River shiner critical habitat, 9.6 acres of potential wetland impacts, and 4.3 acres of impacts to riverine areas. No oil wells, gas wells, or potential hazardous waste sites would be impacted.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Historic/Section 4(f) Impacts

Load-Posted Historic Structure

As the existing Bridge "A" would remain in place, there would be no impact to the historic bridge and therefore no 4(f) use. However, the issue of diminished integrity of feeling, setting, and association of the bridge (three of the aspects of integrity under the NRHP) could potentially occur with the construction of a new, modern bridge adjacent to the historic bridge. Preliminary viewshed analysis suggests that only very sparse, sporadic portions of the new bridge would be

visible from the historic bridge due to thick vegetation and the topography of the area (see **Appendix J** for the preliminary viewshed analysis).

This option would cross over to the west side of the existing US-281 centerline at Sta. 100+70 at the northeast end, and would tie into the existing US-281 centerline further northeast, outside of the Route 66 segment of roadway. At the point of proposed crossing, the roadway has already been reconstructed to a 40 foot wide section with asphalt overlay. The original Portland cement concrete is no longer in place, and this portion of roadway is not contributing to the Historic District. This tie-in was designed in order to avoid impacts to the historic Route 66 pavement along Jones Road.

However, this option would also include a tie-in to the historic Route 66 section on the southwest end of the project limits near Bridge "A" and would widen the historic roadway to correct curves. The historic roadway would be reconstructed for approximately 1 mile west from the proposed tie-in to approximately 1,300 feet north of the I-40/US-281 junction, and would include the reasonable and foreseeable need for Bridge "B" (Tower Bridge) to be replaced. Though the replacement of Bridge "B" would take place under a separate contract, this is still considered a 4(f) use of both the historic roadway and the historic bridge feature. This portion of roadway and all associated roadway features is part of the Bridgeport Hill-Hydro Route 66 Roadway Segment NRHP Historic District This option would greatly diminish aspects of integrity of the historic roadway and bridge under the NRHP, including setting, materials, design, feeling, association and workmanship.

Due to the tie-in with the historic pavement and the reconstruction of historic pavement at the southwest corner of the project area and the reasonable and foreseeable replacement of Bridge "B" on existing alignment, this option would have an overall 4(f) use.

Bicycle and Pedestrian Historic Structure

The removal of vehicular traffic from the historic bridge would be considered an individual 4(f) use of the bridge. Important aspects of the historic integrity of the bridge are its feeling, setting, and association with Route 66 construction and traffic, so the removal of vehicular traffic would seriously diminish the integrity.

Due to the removal of vehicular traffic from the historic bridge and the reasonable and foreseeable replacement of Bridge "B" on existing alignment (discussed above under the Load-Posted Historic Structure option), this option would have a 4(f) use.

Qualitative Economic Analysis

Load-Posted Historic Structure

The removal of heavy truck traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge and its relationship to tourism in the area. Heavy trucks associated with industry would have a safe, new crossing over the South Canadian River, which would be a benefit. However, the prohibition of RV traffic (over five tons) along the historic bridge, related to tourism, could be a deterrent for travelers to the area and could have a detrimental effect to tourism.

Additionally, the removal of Bridge "B" (Tower Bridge) and the reconstruction of a portion of the historic Route 66 roadway would further diminish the tourism draw for this area. Oklahoma currently has more miles of original Route 66 alignment than any other state, and it touts numerous stretches of original concrete paving from 1932-1933. This stretch of roadway is included in that figure, and the loss of a portion of it would diminish tourism to this particular area of Oklahoma. Oklahoma's standing as the state with the most intact miles of Route 66 alignment would be threatened with this reconstruction and removal of the historic bridge, and therefore this could diminish the draw of Oklahoma Route 66 tourism altogether.

Bicycle and Pedestrian Historic Structure

The removal of all vehicular traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge (barring a catastrophic event) and that damage to the bridge associated with vehicular use will cease. However, the tourism draw specifically associated with the experience of driving over the historic bridge would be removed altogether. The bridge would become a different sort of road-side destination for travelers, but it is unknown whether this type of destination would continue to bring visitors from around the world, as the bridge previously has. Fewer visitors to the area would result in fewer dollars being spent on lodging, food, and other services in the neighboring communities and potentially the region as a whole.

Additionally, the removal of Bridge "B" (Tower Bridge) and the reconstruction of a portion of the historic Route 66 roadway would further diminish the tourism draw for this area. Oklahoma currently has more miles of original Route 66 alignment than any other state, and it touts numerous stretches of original concrete paving from 1932-1933. This stretch of roadway is included in that figure, and the loss of a portion of it would diminish tourism to this particular area of Oklahoma. Oklahoma's standing as the state with the most intact miles of Route 66 alignment would be threatened with this reconstruction and removal of the historic bridge, and therefore this could diminish the draw of Oklahoma Route 66 tourism altogether.

Table 6. Alternative C, Option 1 Summary: Load-Posted Historic Structure

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs*	Construction Cost	$46,005,000
	ROW Cost	$380,000
	Utility Cost	$1,060,000
	TOTAL PROJECT COST	**$47,445,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	4.7 ac
	NWI Wetlands and Ponds	9.6 ac
	NWI Riverine Areas	4.3 ac
	Historic/Section 4(f) Impacts	No 4(f) use of bridge; 4(f) use of historic roadway portion by proposed tie-in
	Qualitative Economic Impacts	-Removal of heavy truck traffic would be a benefit to structure's life span -Removal of RVs (over five tons) could deter travelers -Heavy trucks would have safe crossing, and would be a benefit

**Project Costs shown include the reasonable and foreseeable future replacement of Bridge "B." The cost associated with anticipated replacement of Bridge "B" is $8,235,000, consisting of $7,635,000 for Construction, $45,000 for ROW, and $555,000 for Utilities.*

Table 7. Alternative C, Option 1 Summary: Bicycle and Pedestrian Historic Structure

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs*	Construction Cost	$42,870,000
	ROW Cost	$380,000
	Utility Cost	$1,060,000
	TOTAL PROJECT COST	**$44,310,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	4.7 ac
	NWI Wetlands and Ponds	9.6 ac
	NWI Riverine Areas	4.3 ac
	Historic/Section 4(f) Impacts	-Individual 4(f) use of Bridge "A" by removal of vehicular traffic - 4(f) use of historic roadway portion by reconstruction and 4(f) use of Bridge "B" by future replacement
	Qualitative Economic Impacts	-Removal of vehicular traffic would be a benefit to structure's life span -Removal of ability to drive across Bridge "A" and the removal of Bridge "B" could deter visitors to the area

**Project Costs shown include the reasonable and foreseeable future replacement of Bridge "B." The cost associated with anticipated replacement of Bridge "B" is $8,235,000, consisting of $7,635,000 for Construction, $45,000 for ROW, and $555,000 for Utilities.*

5.4.2. Option 2 – South Offset with New Alignment

General Description

Load-Posted Historic Structure

Option 2 alignment begins approximately 1,500 feet north of the US-281/I-40 interchange. It then proceeds easterly and northeasterly for approximately 3.3 miles to a location north of Jones Road (historic Route 66). The alignment is located 1,100 feet south of the existing Bridge "B" (Tower Bridge) location and matches Option 1 from Sta. 92+00 to the end of the alignment. This alignment would leave the existing Bridge "A" (Bridgeport Bridge), Bridge "B" (Tower Bridge), and Bridge "C" in place. Bridge "A" would be load-posted and accessible to passenger vehicles (five-ton limit) only. New structures located downstream from these bridges would be constructed on

the offset alignment. See **Table 8** for summary of evaluation components considered for this alternative.

Bicycle and Pedestrian Historic Structure

This option has the same general description as the load-posted historic structure with the exception that Bridge "A" (Bridgeport Bridge) would be limited to bicycle and pedestrian traffic only. No vehicles would be allowed on the historic bridge. Bridge "A" would be rehabilitated for pedestrian traffic to address the structural deficiency and the required modifications to become a pedestrian bridge. A small parking area on each side of the bridge and bollards to prevent bridge access to vehicular traffic would be included with this option.

Roadway

Load-Posted Historic Structure

The typical section would have a clear roadway width of 40'-0" and consist of two 12' travel lanes with 8' shoulders. Option 2 would include two horizontal curves. The first curve (Sta. 53+31 to Sta. 91+83) would have a 4,450-foot radius and a superelevation rate of 4.0 percent. The second curve (Sta. 154+80 to Sta. 170+12) would have a 5,010-foot radius and superelevation rate of 3.6 percent. This option would introduce a stop condition with an intersection located just north of the westbound I-40 entrance/exit ramps at US-281 on the southwest edge of the project limits. The northeast end of the proposed alignment would cross the US-281 existing alignment in the same location as Option 1, thus avoiding the historic sections of Route 66 along Jones Road.

The proposed profile would be designed to meet a 65 mph design speed. This option would require a significant amount of earthwork, since the existing ground line along the alignment includes a 150 foot change in elevation with grades of up to 27 percent. In order to provide adequate sight distance and safety, the vertical alignment would contain a maximum cut depth of 29 feet and maximum fill height of 65 feet.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure. Additionally, a small parking area on each side of the bridge and bollards to prevent bridge access to vehicular traffic would be included with this option, estimated to cost $200,000.

Bridge

Load-Posted Historic Structure

Option 2 would require the construction of a new bridge over the South Canadian River on a south offset, leaving Bridge "A" (Bridgeport Bridge) in place as a load-posted structure. The new alignment would be offset from the Bridge "A" south abutment by approximately 1,000 feet while the offset from the north abutment would be approximately 300 feet. The new bridge is estimated to be 39 100-foot PC beam spans with a clear roadway width of 40 feet and new load-tested TR-4 traffic rails. Bridge "A" would be rehabilitated for passenger vehicle traffic and small trucks to address the structural deficiency of the bridge, as detailed in Section 5.3.2 of this report. Bridge "A" would remain substandard width but have reduced traffic.

Unlike Option 1, the existing Bridge "B" (Tower Bridge) would not be located on the new alignment, but would remain in place as a load-posted structure on Historic Route 66. The tributary at Bridge "B" splits into two channels just south of the existing alignment. Therefore, it is likely that two structures would have to be built over this tributary for this option. Based on the preliminary hydrology report, reinforced concrete box (RCB) culverts would be required. One structure is anticipated to be a bridge-size, double-cell 10'x8' RCB culvert with a length of 470 feet and covered by over 50 feet of fill. The other structure would be a smaller, roadway-size RCB culvert. Due to the large amount of fill, a span structure was also estimated in place of the two RCB culverts. Based on the proposed profile and deep ravines, the bridge would be approximately 1200' in length with piers in excess of 50 feet in height. The additional cost to construct the span bridge instead of the RCB culverts with significant fill would be $9,140,000, which does not take into account the higher maintenance costs as well.

Similar to Option 1, this option would require constructing a new bridge structure downstream from the existing Bridge "C", along the new alignment, estimated to be a double-cell 10'x8' RCB culvert with a length of 140 feet. Refer to **Appendix K** for location of proposed bridge-sized structures.

Bicycle and Pedestrian Historic Structure

Bridge "A" improvements would include painting of the existing steel components and replacement of the bridge deck. A limited number of steel members and gusset plates would need to be replaced only in locations of collision damage and excessive corrosion. Additional railing would be attached between and above the existing railing in order to retrofit the bridge for pedestrian and bicycle safety. After Bridge "A" is rehabilitated and painted, the only maintenance for this bridge would be to keep the pavement clear of vegetation and debris. Applying salt to the deck surface during winter snow and ice storms would no longer be required

or recommended. Inspections of the bridge condition would be less frequent if vehicular traffic is removed. The existing width of the bridge is acceptable for bicycle and pedestrian use.

Hydrology

Load-Posted Historic Structure

Based on preliminary analysis, Bridge "A" (Bridgeport Bridge) is not a major restriction to the water surface profile of the South Canadian River. Therefore, a new bridge to carry the proposed US-281 alignment would be of similar length and low chord elevation. The new structure, to be constructed on the new alignment downstream from the existing Bridge "C", would likely be a 10'x8' RCB culvert based on the existing terrain. Due to the extreme height of the Bridge "B" (Tower Bridge) deck surface above the channel flowline, the existing bridge has excess hydraulic capacity. The existing stream splits into two tributaries at the proposed Option 2 alignment. Based on the preliminary calculations, the west tributary structure would be a single-cell 8'x8' RCB culvert, and the east tributary structure would be a double-cell 10'x8' RCB culvert, The new structures would be sized to produce no detrimental hydraulic impacts to the existing bridges. A preliminary analysis of the hydrologic and hydraulic conditions was performed by Meshek and Associates and can be found in **Appendix H**.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Construction and Traffic Control

Load-Posted Historic Structure

The roadway would remain open during the construction period. Temporary pavement widening would be required at the north tie-in to maintain access during construction. Similar to Option 1, a temporary detour of approximately 800 feet would be needed where the proposed alignment crosses the existing US-281 alignment. The proposed bridge and the majority of the roadway could be constructed without impacting the existing traffic. The construction estimate for this option is $45,825,000 which includes the new alignment at $34,520,000 and Bridge "A" (Bridgeport Bridge) rehabilitation to load-posted structure at $11,305,000. (**Appendix G**).

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure with the additional cost for construction of parking facilities and a different cost for rehabilitation to the existing Bridge "A". The construction estimate for this option is $42,690,000 which includes the new alignment at $34,520,000, parking

at $200,000, and Bridge "A" (Bridgeport Bridge) rehabilitation to a bicycle and pedestrian structure at $7,970,000 (**Appendix G**).

Right-of-Way Impacts

Load-Posted Historic Structure

Option 2 would require additional right-of-way that impacts ten parcels. The estimated amount of right-of-way needed for this alternative would be 77.34 acres. One relocation at Sta. 54+25 would be anticipated with this option. The right-of-way estimate for this option is $710,000. See **Appendix I** for right-of-way estimate details.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Utility Impacts

Load-Posted Historic Structure

There are seven utilities that would be affected with this alternative. Hinton telephone has three crossings at Sta. 0+77, 34+33, and 148+56. Windstream has a fiber optic crossing at Sta. 1+06. Dobson has a parallel fiber optic line from Sta. 15+00 to 35+60. EnLink Midstream has a 24-inch gas line at Sta. 34+19 and a 10.75-inch gas line at Sta. 154+11. Mustang Fuel has a 6-inch gas line crossing at Sta. 81+74. Caddo Electric has parallel line from Sta. 142+00 to 151+00 and three other crossings. The utility relocation estimate for this option is $915,000. See **Appendix C** for preliminary utility relocation estimate details.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Environmental Impacts

Load-Posted Historic Structure

Option 2 would result in approximately 3.5 acres of impacts to Arkansas River shiner critical habitat, 7.9 acres of potential wetland and pond impacts, and 3.4 acres of impacts to riverine areas. No oil wells, gas wells, or potential hazardous waste sites would be impacted.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Historic/Section 4(f) Impacts

Load-Posted Historic Structure

As the existing Bridge "A" would remain in place, there would be no impact to the historic bridge and therefore no 4(f) use of the bridge. However, the issue of diminished integrity of feeling and association of the bridge (two of the aspects of integrity under the NRHP) could potentially occur with the construction of a new, modern bridge adjacent to the historic bridge. Preliminary viewshed analysis suggests that only very sparse, sporadic portions of the new bridge would be visible from the historic bridge due to thick vegetation and the topography of the area (see **Appendix J** for preliminary viewshed analysis). Passenger vehicles (five-ton limit) would continue to be allowed to travel on the bridge.

The northeast end of the proposed alignment would cross the existing US-281 at Sta. 100+70, and it would tie into the existing US-281 centerline further northeast, outside of the Route 66 segment of roadway. At the point of the proposed crossing, the roadway has already been reconstructed to a 40 foot wide section with asphalt overlay. The original Portland cement concrete is no longer in place, and this portion of roadway is not contributing to the Historic District. This tie-in was designed in order to avoid impacts to the historic Route 66 pavement along Jones Road. This option would avoid a 4(f) use of the Historic District.

On the southwest end of the project, this option would include constructing an intersection located just north of the westbound I-40 entrance/exit ramps at US-281. This new intersection would not be located within the NRHP-listed Historic District and would therefore not be a 4(f) use.

This option would result in no 4(f) use of historic resources.

Bicycle and Pedestrian Historic Structure

The removal of vehicular traffic from the historic bridge would be considered an individual 4(f) use of the bridge. Important aspects of the historic integrity of the bridge are its feeling, setting,

and association with Route 66 construction and traffic, so the removal of vehicular traffic would seriously diminish the integrity.

Qualitative Economic Analysis

Load-Posted Historic Structure

The removal of heavy truck traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge and its relationship to continued tourism in the area. Heavy trucks associated with industry would have a safe, new crossing over the South Canadian River, which would be a benefit. However, the prohibition of RV traffic (over five tons) along the historic bridge, related to tourism, could be a deterrent for travelers to the area and could have a detrimental effect to tourism.

Bicycle and Pedestrian Historic Structure

The removal of all vehicular traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge (barring a catastrophic event) and that damage to the bridge associated with automobiles will cease. However, the tourism draw associated with the experience of driving over the historic bridge would be removed altogether. The bridge would become a different sort of road-side destination for travelers, but it is unknown whether this type of destination would continue to bring visitors from around the world, as the bridge previously has. Fewer visitors to the area would result in fewer dollars being spent on lodging, food, and other services in the neighboring communities and potentially the region as a whole.

Table 8. Alternative C, Option 2 Summary: Load-Posted Historic Structure

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs*	Construction Cost	$45,825,000
	ROW Cost	$710,000
	Utility Cost	$915,000
	TOTAL PROJECT COST	**$47,450,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	3.5 ac
	NWI Wetlands and Ponds	7.9 ac
	NWI Riverine Areas	3.4 ac
	Historic/Section 4(f) Impacts	No 4(f) use with bridge or tie-ins to roadway
	Qualitative Economic Impacts	-Removal of heavy truck traffic from structure is considered benefit for life of bridge - Removal of RVs (over five tons) along bridge could be deterrent for travelers -Heavy trucks associated with industry would have a safe, new crossing, which would be a benefit

**For a span bridge structure over the channels south of the Tower Bridge in place of the two RCB culverts with significant fill, increase the Construction Cost by $9,140,000.*

Table 9. Alternative C, Option 2 Summary: Bicycle and Pedestrian Structure

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs*	Construction Cost	$42,690,000
	ROW Cost	$710,000
	Utility Cost	$915,000
	TOTAL PROJECT COST	**$44,315,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	3.5 ac
	NWI Wetlands and Ponds	7.9 ac
	NWI Riverine Areas	3.4 ac
	Historic/Section 4(f) Impacts	Individual 4(f) use by removing vehicular traffic from bridge
	Qualitative Economic Impacts	-Removal of vehicular traffic from structure is considered benefit for life of bridge - Removal of ability to drive across bridge could be deterrent for travelers to the area

**For a span bridge structure over the channels south of the Tower Bridge in place of the two RCB culverts with significant fill, increase the Construction Cost by $9,140,000.*

5.4.3. Option 3 - North Offset with New Alignment

General Description

Load-Posted Historic Structure

This alternative begins 1,300 feet north of the I-40/US-281 junction, extends to the north, and crosses the South Canadian River upstream of the existing Bridge "A" (Bridgeport Bridge). The total length of this alternative is 4.0 miles. The new South Canadian River bridge crossing for this alternative is approximately 5,500 feet north of the existing Bridgeport Bridge. This option would leave the existing Bridge "A" structure in place, load-posted, and accessible to passenger vehicles (five-ton limit) only. This option would tie into the existing alignment 4,000 feet north of the junction of US-281 and Jones Road. See **Table 10** for summary of evaluation components considered for this alternative.

Bicycle and Pedestrian Historic Structure

This option has the same general description as the load-posted historic structure with the exception that Bridge "A" (Bridgeport Bridge) would be limited to bicycle and pedestrian traffic

only. No vehicles would be allowed on the historic bridge. Bridge "A" would be rehabilitated for pedestrian traffic to address the structural deficiency and the required modifications to become a pedestrian bridge. A small parking area on each side of the bridge and bollards to prevent bridge access to vehicular traffic would be included with this option. The existing section of US-281 on each end of the bridge that remained would need to be reclassified as an entrance or access road, since they would terminate at the parking areas.

Roadway

Load-Posted Historic Structure

The typical section would have a clear roadway width of 40'-0" and consist of two 12' travel lanes with 8' shoulders. Option 3 would include three horizontal curves. The first curve (Sta.25+55 to Sta. 50+94) would have a 2,840-foot radius and a superelevation rate of 5.8 percent. The second curve (Sta. 107+89 to Sta. 123+08) is located on the northeast side of the proposed bridge, and would also have a 2,840-foot radius with a superelevation rate of 5.8 percent. The last horizontal curve (Sta. 176+55 to Sta. 208+42) would have a 3,820-foot radius with a superelevation rate of 5.1 percent. This alignment would be designed to cross the river at a favorable location based on hydraulic requirements and bridge layout and would avoid the numerous gas well sites in the area.

The profile would be designed to meet a 65 mph design speed. The existing terrain along the alignment would not be as severe as Option 2 in regards to elevation change and steepness of grade. Therefore, the vertical profile would be able to follow more closely to the existing ground. The maximum cut would be approximately 13 feet and the maximum fill would be approximately 47 feet.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure. Additionally, a small parking area on each side of the bridge and bollards to prevent bridge access to vehicular traffic would be included with this option, estimated to cost $200,000.

Bridge

Load-Posted Historic Structure

Option 3 would require the construction of a new bridge over the South Canadian River on a north offset of approximately 5,500 feet. The new bridge is estimated to be 39 100-foot PC beam spans with a clear roadway width of 40 feet and TR-4 traffic rails. The existing Bridge "A" (Bridgeport Bridge) and Bridge "B" (Tower Bridge) would remain in place as load-posted historic

structures. Bridge “A” would be rehabilitated for passenger vehicle traffic and small trucks to address the structural deficiency of the bridge, as detailed in Section 5.3.2 of this report. Bridge “A” and “B” would remain substandard width but would have reduced traffic. Due to the alignment being located to the north, the tributary that flows under Bridge "B” and Bridge “C” would not cross the alignment for this option; however, the proposed alignment would cross other drainage tributaries. Two of these crossings have been estimated to require bridge-size RCB culvert structures. The first tributary would have a drainage area of 0.59 square miles and would cross the alignment at Sta. 34+10. A double-cell 10’x8’ reinforced concrete box (RCB) culvert has been estimated at this location. The other tributary crossing location would be at Sta. 165+00 and include a drainage area of 2.14 square miles. This structure has been estimated as a double-cell 10’x10’ RCB culvert.

Bicycle and Pedestrian Historic Structure

Bridge “A” improvements would include painting of the existing steel components and replacement of the bridge deck. A limited number of steel members and gusset plates would need to be replaced only in locations of collision damage and excessive corrosion. Additional railing would be attached between and above the existing railing in order to retrofit the bridge for pedestrian and bicycle safety. After Bridge “A” is rehabilitated and painted, the only maintenance for this bridge would be to keep the pavement clear of vegetation and debris. Applying salt to the deck surface during winter snow and ice storms would no longer be required or recommended. Inspections of the bridge condition would be less frequent if vehicular traffic is removed. The existing width of the bridge is acceptable for bicycle and pedestrian use.

Hydrology

Load-Posted Historic Structure

Based on preliminary analysis, Bridge “A” (Bridgeport Bridge) is not a major restriction to the water surface profile of the South Canadian River. Therefore, a new bridge to carry the proposed US-281 alignment would be of similar length and low chord elevation. The new structures would be sized to produce no detrimental hydraulic impacts to the existing bridges. A preliminary analysis of the hydrologic and hydraulic conditions was performed by Meshek and Associates and can be found in **Appendix H**.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Construction and Traffic Control

Load-Posted Historic Structure

Similar to Option 1 and 2, this alternative would allow for the existing roadway to remain open during construction. There would be temporary pavement widening at the beginning and end of the project to tie into the existing road. The proposed alignment would not cross the existing alignment; therefore, the majority of the alignment could be built without affecting the existing traffic. The construction estimate for this option is $47,595,000 which includes the new alignment at $36,290,000 and Bridge "A" (Bridgeport Bridge) rehabilitation to a load-posted structure at $11,305,000. (**Appendix G**).

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure with the additional cost for construction of parking facilities and a different cost for rehabilitation to the existing Bridge "A". The construction estimate for this option is $44,460,000 which includes the new alignment at $36,290,000, parking at $200,000, and Bridge "A" (Bridgeport Bridge) rehabilitation to pedestrian structure at $7,970,000.

Right-of-Way Impacts

Load-Posted Historic Structure

Option 3 would require additional right-of-way that impacts 18 parcels. The estimated amount of right-of-way needed for this alternative would be 109.46 acres. No relocations would be anticipated with this option. The right-of-way estimate for this option is $880,000. See **Appendix I** for right-of-way estimate details.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Utility Impacts

Load-Posted Historic Structure

This option would include impacts to six utilities. PSO has a 3-wire overhead electric from Sta. 10+00 to 17+86 on the left side of the alignment, and a 3-wire overhead from Sta. 10+00 to 11+58 on the right side. They also have an overhead crossing at Sta. 11+57. Caddo Electric has a single phase aerial crossing at Sta. 75+90. Dobson has an underground fiber optic crossing at Sta. 13+30. Pioneer Telephone has an underground crossing at Sta. 165+80. EnLink Midstream has several gas lines crossing this option as follows: 4.5-inch line at Sta. 48+80, 12.75-inch line at 52+00, 24-

inch line at 83+50, 24-inch line at 98+20, 24-inch line at 112+70, and 12.75-inch line at 165+70. The alignment crosses the same 24-inch gas line three times. Mustang fuel has a 6-inch gas crossing at Sta. 121+30. These gas line crossings make up the majority of the utility relocation cost. The utility relocation estimate for this option is $2,565,000. See **Appendix C** for utility relocation estimate details.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Environmental Impacts

Load-Posted Historic Structure

Option 3 would result in approximately 6.8 acres of impacts to Arkansas River shiner critical habitat, 15.4 acres of potential wetland impacts, and 6.1 acres of impacts to riverine areas. No oil wells, gas wells, or potential hazardous waste sites would be impacted.

Bicycle and Pedestrian Historic Structure

Same as Load-Posted Historic Structure.

Historic/Section 4(f) Impacts

Load-Posted Historic Structure

As the existing Bridge "A" would remain in place, there would be no impact to the historic bridge and therefore no 4(f) use. However, the issue of diminished integrity of feeling and association of the bridge (two of the aspects of integrity under the NRHP) could potentially occur with the construction of a new, modern bridge adjacent to the historic bridge. In this case, the new bridge would be over 5,000 feet upstream from the existing historic bridge. Preliminary viewshed analysis suggests that only very sparse, sporadic portions of the new bridge would be visible from the historic bridge due to thick vegetation, the topography of the area, and the distance from the existing bridge to the new one (see **Appendix J** for preliminary viewshed analysis). Passenger vehicles (five-ton limit) would continue to be allowed to travel on the bridge.

The proposed tie-in at the northeast edge of the project limits would be on US-281 approximately 4,000 ft. north of the US-281/Jones Road intersection, and outside of the historic Route 66 roadway. This tie-in would not be considered a 4(f) use.

The proposed tie-in on the southwest edge of the project limits would be along US-281 (not the portion that is a part of the historic alignment of Route 66), and the new alignment would cross

through the historic Route 66 at the Hinton Junction. This Y intersection is not considered contributing to the Historic District, as it already includes a tie-in with the modern US-281 alignment and has been altered from its original alignment. Therefore this tie-in would not be considered a 4(f) use.

Overall, this option would result in no 4(f) use of historic resources.

Bicycle and Pedestrian Historic Structure

The removal of vehicular traffic from the historic bridge would be considered an individual 4(f) use of the bridge. Important aspects of the historic integrity of the bridge are its feeling, setting, and association with Route 66 construction and traffic, so the removal of vehicular traffic would seriously diminish the integrity.

Qualitative Economic Analysis

Load-Posted Historic Structure

The removal of heavy truck traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge and its relationship to tourism. Heavy trucks associated with industry would have a safe, new crossing over the South Canadian River, which would be a benefit. However, the prohibition of RV traffic (over five tons) along the historic bridge, related to tourism, could be a deterrent for travelers to the area and could have a detrimental effect to tourism in the area.

Bicycle and Pedestrian Historic Structure

The removal of all vehicular traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge (barring a catastrophic event) and that damage to the bridge associated with automobiles will cease. However, the tourism draw associated with the experience of driving over the historic bridge would be removed altogether. The bridge would become a different sort of road-side destination for travelers, but it is unknown whether this type of destination would continue to bring visitors from around the world, as the bridge previously has. Fewer visitors to the area would result in fewer dollars being spent on lodging, food, and other services in the neighboring communities and potentially the region as a whole.

Table 10. Alternative C, Option 3 Summary: Load-Posted Historic Structure

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs	Construction Cost	$47,595,000
	ROW Cost	$880,000
	Utility Cost	$2,565,000
	TOTAL PROJECT COST	**$51,040,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	6.8 ac
	NWI Wetlands and Ponds	15.4 ac
	NWI Riverine Areas	6.1 ac
	Historic/Section 4(f) Impacts	No 4(f) use associated with bridge or tie-ins to roadway
	Qualitative Economic Impacts	-Removal of heavy truck traffic from structure is considered a benefit for prolonged life of bridge - Removal of RVs (over five tons) could deter travelers -Heavy trucks would have a safe, new crossing, which would be a benefit

Table 11. Alternative C, Option 3 Summary: Bicycle and Pedestrian Historic Structure

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs	Construction Cost	$44,460,000
	ROW Cost	$880,000
	Utility Cost	$2,565,000
	TOTAL PROJECT COST	**$47,905,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	6.8 ac
	NWI Wetlands and Ponds	15.4 ac
	NWI Riverine Areas	6.1 ac
	Historic/Section 4(f) Impacts	Individual 4(f) use by removal of vehicular traffic from bridge
	Qualitative Economic Impacts	-Removal of vehicular traffic from structure is considered a benefit for prolonged life of bridge - Removal of ability to drive across bridge could deter travelers

5.4.4. Option 4 – Reconstruct on Existing Alignment

General Description

Option 4 begins approximately 1,300 feet north of the I-40/US-281 junction) and proceeds generally northeast for approximately 2.9 miles to a location south of Jones Road (historic Route 66). This alignment follows the existing alignment and would include the removal and replacement of Bridge "A" (Bridgeport Bridge) and Bridge "B" (Tower Bridge). Bridge "C" would be extended with this option. The construction, utility, and R/W costs have been calculated separately for the Bridge "A" segment (Sta. 74+81 to 162+00) and Bridge "B" segment (Sta. 10+00 to 74+81). Separating these two segments for the estimate conforms to the current ODOT plan to construct these projects in separate contracts/years. In order to provide an appropriate, overall cost comparison of the various alternatives and options, these segments will be reported together within this report. See **Table 12** for summary of evaluation components considered for this alternative.

Roadway

The typical section would have a clear roadway width of 40'-0" and consist of two 12' travel lanes with 8' shoulders. Option 4 would contain three horizontal curves. The first curve would begin at Sta. 10+89 with a 1,140-foot radius and meet a 55 mph design with a superelevation of 7.8 percent. The speed limit for this curve is currently set at 55 mph and would need to remain as such. The second curve would begin at Sta. 58+74 with an 11,459-foot radius and would require a superelevation of 2% or reverse crown. The last curve would begin at 74+81 with a 1,637-foot radius and a 7.8 percent superelevation based on a maximum value of 8 percent. The alignment on the north end would tie into the existing improved section. The proposed profile would be designed to meet a 65 mph design speed. This alignment would correct the existing vertical curves that do not meet current roadway design standards.

Bridge

Option 4 would include the reconstruction of Bridge "A" (Bridgeport Bridge) in the same location and at the same length as the existing bridge. The new bridge is estimated to be 39 100-foot PC beam spans with a clear roadway width of 40 feet and TR-4 traffic rails. Bridge "B" (Tower Bridge) would include reconstruction in the same location, which may be completed on a separate contract. The new bridge is estimated to be 4 100-ft PC beam spans with a clear roadway width of 40 feet and TR-4 traffic rails. The new structure would require piers over 50 feet in height. Bridge "C" would be extended with this option.

Hydrology

Based on preliminary analysis, Bridge "A" (Bridgeport Bridge) is not a major restriction to the water surface profile on the South Canadian River. Therefore, a replacement bridge of similar length and low chord elevation was estimated. The new structures would be sized to produce no detrimental hydraulic impacts to the existing bridges. A preliminary analysis of the hydrologic and hydraulic conditions was performed by Meshek and Associates and is found in **Appendix H**.

Construction and Traffic Control

Unlike the other options, this alternative would require the closure of US-281 at the bridge and a detour. The detour route would follow along I-40 on the south, then along the US-281 spur on the east. This detour would be approximately 13 miles long. There would be no temporary widening needed with this option. The construction cost estimate for this option is $33,645,000 which includes Bridge "A" (Bridgeport Bridge) at $25,655,000 and Bridge "B" (Tower Bridge) at $7,990,000. (**Appendix G**).

Right-of-Way Impacts

Option 4 would require additional right-of-of way that impacts 8 parcels. The estimated amount of right-of-way needed for Bridge "A" (Bridgeport Bridge) would be 3.96 acres and Bridge "B" (Tower Bridge) would be 5.40 acres. No relocations would be anticipated with this option. The right-of-way estimate for this option is $75,000. See **Appendix I** for right-of-way estimate details.

Utility Impacts

This option would result in impacts to five utilities. Hinton telephone has a fiber optic which will need to be relocated from Sta. 10+00 to 67+00 and telephone underground lines at the following locations, Sta. 31+00 to 38+00 Rt., Sta. 33+00 to 37+00 Lt., and Sta. 51+00 to 71+00 Rt. AT&T has an underground fiber optic line running parallel to the road that would need to be relocated from Sta. 79+81 to 162+00. Hinton also has an underground fiber optic line running parallel to the road that would need to be relocated from Sta. 106+71 to 167+00. The fiber optic for Hinton Telephone and AT&T both are hung off of the existing bridge. Caddo Electric has a triple phase aerial parallel from Sta. 74+81 to 92+81. Enlink Midstream has a 24" gas line crossing at Sta. 50+24 and a 4.5" gas line crossing at Sta. 63+50. The utility relocation estimate for this option is $935,000 which includes Bridge "A" (Bridgeport Bridge) at $380,000 and Bridge "B" (Tower Bridge) at $555,000. See **Appendix C** for utility relocation estimate details.

Environmental Impacts

Option 4 would result in approximately 2.4 acres of impacts to Arkansas River shiner critical habitat, 0.2 acres of potential wetland impacts, and 1.2 acres of impacts to riverine areas. No oil wells, gas wells, or potential hazardous waste sites would be impacted.

Historic/Section 4(f) Impacts

The removal of the historic bridge and roadway features would result in an individual Section 4(f) use, and would require extensive documentation indicating that this is the most feasible and prudent option, if this option were chosen as the preferred alternative. Currently, there are other options proposed that would not result in a 4(f) use. It would also require measures to minimize and mitigate harm associated with the loss of the historic bridge structure and any associated roadway features, all of which are listed in the NRHP and are of high significance.

Qualitative Economic Analysis

The loss of the historic bridge and associated roadway features would have a very serious detrimental impact to the tourism industry of the area, as they are a major destination for travelers both domestic and international. The bridge itself is a major destination, for Oklahoma visitors, domestic travelers, and those from outside of the United States. A large part of the allure of the bridge is the ability to drive along it, and that would no longer be possible under this option. As Oklahoma has the largest contiguous stretch of Route 66 in the nation, travelers would likely still visit the state and potentially even this region to see other areas of Route 66 and intact features along the roadway. However, the loss of the bridge, in particular, would mean that travelers may not spend as much time in this region, nor patronize businesses (restaurants, lodging, and gas stations) in the neighboring communities of Geary, Hinton, and Fort Reno or along Route 66 in this area. If they do visit, it is likely that they would not spend as much time in the area because one of the major attractions would no longer be present to visit.

However, a safe, new crossing over the South Canadian River would be of benefit to heavy truck traffic associated with industries in the area, other than tourism. In fact, the modern crossing of the South Canadian River would be a benefit to all traffic as it would provide shoulders and additional width to provide potentially safer conditions.

Table 12. Alternative C, Option 4 Summary

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	No
Project Costs*	Construction Cost	$33,645,000
	ROW Cost	$75,000
	Utility Cost	$935,000
	TOTAL PROJECT COST	**$34,655,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	2.4 ac
	NWI Wetlands and Ponds	0.2 ac
	NWI Riverine Areas	1.2 ac
	Historic/Section 4(f) Impacts	Yes, 4(f) use of bridge and roadway features
	Qualitative Economic Impacts	-Loss of historic bridge and the tourism draw it provides would be detrimental to region and state. -A new, wider bridge in the same location would be of potential benefit for all traffic

**Project Costs shown include the reasonable and foreseeable future replacement of Bridge "B." The cost associated with anticipated replacement of Bridge "B" is $8,590,000, consisting of $7,990,000 for Construction, $45,000 for ROW, and $555,000 for Utilities.*

5.5. Alternative D – Retain Existing Structure as an Off-System "Monument"

5.5.1. Option 1 – Oklahoma Department of Transportation Retains Ownership

General Description

Under this alternative, Bridge "A" would remain under its current ODOT ownership but would be closed to vehicular traffic, remaining in place as an off-system monument. A small parking area on each side of the bridge and bollards to prevent bridge access from vehicular traffic would be included with this option. The existing sections of US-281 on each end of the bridge that remain would be removed from the state highway system and would need to be reclassified as an entrance or access road, since they would terminate at the parking areas. Bridge "B" rehabilitation or replacement would be completed under a separate contract. See **Table 13** for summary of evaluation components considered for this alternative.

Roadway

There would be minimal improvement to the roadway under this alternative. The roadway would serve only as an access road for the Bridge "A" monument and local properties along the portions of the roadway that remain open. The current US-281 spur would likely become US-281; however, the specifics of the designation of the roadway are as yet undetermined. A small parking area on each side of the bridge and bollards to prevent bridge access from vehicular traffic would be included with this option. The roadway construction cost to build two small parking lots and re-sign the new US-281 route would be approximately $300,000.

Bridge

Bridge "A" improvements would include painting of the existing steel components, replacement of the bridge deck, and modifications to the rail for pedestrian use. After these measures, the only maintenance for Bridge "A" would be to periodically clear it of vegetation and debris. Applying salt to the deck surface during winter snow and ice storms would no longer be required or recommended, as the salt would continue to damage the deck and steel components. Inspections of the bridge condition would be less frequent if vehicular traffic is removed. The existing width of the bridge is acceptable for bicycle and pedestrian use and would not be changed.

Bridge "B" (Tower Bridge) would not be rehabilitated with this alternative. It is anticipated that the Tower Bridge will need to be replaced or rehabilitated in the near future; however, this would occur on a different contract and would require separate Section 4(f) analysis. An estimated cost to replace Bridge "B" is included in the construction cost estimate below.

Hydrology

There would be no impact to the hydrology of the South Canadian River, as the bridge has been in place for over 80 years and channeling and flood control efforts upstream have been taking place since before the bridge was constructed in 1933.

Construction and Traffic Control

This alternative would require permanently closing the existing road to vehicular traffic and rerouting traffic on existing highways. The existing highways would follow along I-40 on the south, then along the US-281 spur on the east. This reroute is approximately 13 miles long. Signing would need to be revised along I-40 and US-281. There would be no temporary widening needed with this option. The construction estimate for this option is $16,260,000 which includes

parking and signing at $300,000, Bridge "A" rehabilitation to a pedestrian structure at $7,970,000, and Bridge "B" reconstruction at $7,990,000 (**Appendix G**).

Right-of-Way Impacts

There would be no right-of-way impacts as there would be no right-of-way acquired under this alternative. Cost to acquire right-of-way for the future reconstruction of Bridge "B" under a separate contract was estimated at $45,000.

Utility Impacts

AT&T and Hinton Telephone both have a fiber optic line hung on the existing Bridge "A". Under this alternative it has been estimated that these utilities would need to be relocated. The utility relocation estimate for this option is $200,000 for Bridge "A" and $555,000 for Bridge "B". See **Appendix C** for preliminary utility relocation estimate details.

Environmental Impacts

Because there would be no alteration from the existing footprint of the bridge, there would be no negative impacts to the Arkansas River shiner, wetland areas, or riverine areas. No oil wells, gas wells, or potential hazardous waste sites would be impacted.

Potential environmental benefits that may be realized from the implementation of this alternative include the elimination of potential hazardous material spills into the river at this crossing, reduction of vehicle-related pollutants washing from the bridge into the river and adjacent wetlands, and reduction of road noise to nearby migratory bird and wildlife species.

Historic/Section 4(f) Impacts

The removal of vehicular traffic from the historic bridge would be considered an individual 4(f) use of the bridge. Important aspects of the historic integrity of the bridge are its feeling, setting, and association with Route 66 construction and traffic, so the removal of vehicular traffic would seriously diminish the integrity.

However, maintaining the bridge as a monument could potentially factor into possible mitigation efforts for the Section 4(f) use of the bridge. These would be considered further if this alternative is chosen as the preferred alternative.

Qualitative Economic Analysis

The removal of all vehicular traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge (barring a catastrophic event) and that damage to the bridge

associated with automobiles will cease. However, the tourism draw associated with the experience of driving over the historic bridge would be removed altogether. The bridge would become a different sort of road-side destination for travelers, but it is unknown whether this type of destination would continue to bring visitors from around the world, as the bridge previously has. Fewer visitors to the area would result in fewer dollars being spent on lodging, food, and other services in the neighboring communities and potentially the region as a whole.

Options for engaging tourists at the monument could be considered as mitigation efforts if this alternative is chosen as the preferred alternative.

Table 13. Alternative D, Option 1 Summary

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs*	Construction Cost	$16,260,000
	ROW Cost	$45,000
	Utility Cost	$755,000
	TOTAL PROJECT COST	**$17,060,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	None
	NWI Wetlands and Ponds	None
	NWI Riverine Areas	None
	Historic/Section 4(f) Impacts	Individual 4(f) use by removal of vehicular traffic from bridge
	Qualitative Economic Impacts	-Removal of vehicular traffic from structure is considered a benefit for prolonged life of bridge - Removal of ability to drive across bridge could deter travelers

**Project Costs shown include the reasonable and foreseeable future replacement of Bridge "B." The cost associated with anticipated replacement of Bridge "B" is $8,590,000, consisting of $7,990,000 for Construction, $45,000 for ROW, and $555,000 for Utilities.*

5.5.2. Option 2 – Ownership Transferred to a Private or Public Entity

General Description

Under this alternative, ownership of Bridge "A" would be removed from the state highway system and transferred to a separate private or public entity. The roadway would be closed to vehicular traffic, remaining in place as an off-system monument. The existing section of US-281 on each end of the bridge that remained would need to be reclassified as an entrance or access

road, since they would terminate at the parking areas. Bridge "B" rehabilitation or replacement would be completed under a separate contract. See **Table 14** for summary of evaluation components considered for this alternative.

Roadway

The roadway section would be transferred from ODOT to the new owner. All future maintenance of the roadway would be the responsibility of the new owner. This alternative would require permanently rerouting US-281 traffic on existing highways. The existing highways would follow along I-40 on the south, then along the US-281 spur on the east. This reroute is approximately 13 miles long. Signing would need to be revised along I-40 and US-281. The roadway construction cost for re-signing the new US-281 route would be approximately $100,000.

Bridge

Bridge "A" ownership would be transferred from ODOT to the new owner. All rehabilitation and future maintenance of the bridge would be the responsibility of the new owner.

The Tower Bridge would not be rehabilitated with this Alternative. It is anticipated that the Tower Bridge will need to be replaced or rehabilitated in the near future; however this would occur on a different contract and would require separate Section 4(f) analysis. A cost estimate to replace Bridge "B" is included in the construction cost estimate below.

Hydrology

There would be no impact to the hydrology of the South Canadian River, as the bridge has been in place for over 80 years and channeling and flood control efforts upstream have been taking place since before the bridge was constructed in 1933.

Construction and Traffic Control

This alternative would require rerouting US-281 traffic on existing highways. The existing highways would follow along I-40 on the south, then along the US-281 spur on the east. This reroute is approximately 13 miles long. Signing would need to be revised along I-40 and US-281. The construction cost estimate for this option is $8,090,000, consisting of $100,000 for signage and $7,990,000 for Bridge "B" (**Appendix G**).

Right-of-Way Impacts

There would be no right-of-way impacts as there would be no right-of-way acquired under this alternative. Cost to acquire right-of-way for the future reconstruction of Bridge "B" under a separate contract was estimated at $45,000.

Utility Impacts

AT&T and Hinton Telephone both have a fiber optic line hung on the existing bridge. Under this alternative it has been estimated that these utilities would need to be relocated. The utility relocation estimate for this option is $200,000 and $555,000 for Bridge "B". See **Appendix C** for preliminary utility relocation estimate details.

Environmental Impacts

Because there would be no alteration from the existing footprint of the bridge, there would be no negative impacts to the Arkansas River shiner, wetland areas, or riverine areas. No oil wells, gas wells, or potential hazardous waste sites would be impacted.

Potential environmental benefits that may be realized from the implementation of this alternative include the elimination of potential hazardous material spills into the river at this crossing, reduction of vehicle-related pollutants washing from the bridge into the river and adjacent wetlands, and reduction of road noise to nearby migratory bird and wildlife species.

Historic/Section 4(f) Impacts

The removal of vehicular traffic from the historic bridge would be considered an individual 4(f) use of the bridge. Important aspects of the historic integrity of the bridge are its feeling, setting, and association with Route 66 construction and traffic, so the removal of vehicular traffic would seriously diminish the integrity.

However, maintaining the bridge as a monument could potentially factor into possible mitigation efforts for the Section 4(f) use of the bridge. These would be considered further if this alternative is chosen as the preferred alternative.

Qualitative Economic Analysis

The removal of all vehicular traffic from the Bridge "A" structure would be considered a benefit for the prolonged life of the bridge (barring a catastrophic event) and that damage to the bridge associated with automobiles will cease. However, the tourism draw associated with the experience of driving over the historic bridge would be removed altogether. The bridge would

become a different sort of road-side destination for travelers, but it is unknown whether this type of destination would continue to bring visitors from around the world, as the bridge previously has. Fewer visitors to the area would result in fewer dollars being spent on lodging, food, and other services in the neighboring communities and potentially the region as a whole.

Options for engaging tourists at the monument could be considered as mitigation efforts if this alternative is chosen as the preferred alternative.

Table 14. Alternative D, Option 2 Summary

Purpose and Need	Provides a bridge crossing that is structurally sufficient for its intended use	Yes
	Preserves Route 66 as a tourist destination in Oklahoma	Yes
Project Costs*	Construction Cost*	$8,090,000
	ROW Cost*	$45,000
	Utility Cost*	$755,000
	TOTAL PROJECT COST	**$8,890,000**
Environmental, Historic, and Economic Impacts	Arkansas River shiner critical habitat	None
	NWI Wetlands and Ponds	None
	NWI Riverine Areas	None
	Historic/Section 4(f) Impacts	Individual 4(f) use by removal of vehicular traffic from bridge
	Qualitative Economic Impacts	-Removal of vehicular traffic from structure is considered a benefit for prolonged life of bridge - Removal of ability to drive across bridge could deter travelers

**Project Costs shown include the reasonable and foreseeable future replacement of Bridge "B." The cost associated with anticipated replacement of Bridge "B" is $8,590,000, consisting of $7,990,000 for Construction, $45,000 for ROW, and $555,000 for Utilities.*

5.6. Summary of Alternatives

Table 15 provides a summary of the construction cost, right-of-way impacts and costs, utility relocation costs, environmental, historic resources and Section 4(f) impacts, and qualitative economic impacts for the three alternatives and six options.

Table 15. Summary Matrix of Project Alternatives

Alternative Analysis Condition		Roadway	Bridge	Hydro-logical Impacts	Construction Cost	Right-of-Way Impacts	Utility Impacts	Total Estimated Cost	Environmental Impacts			Historic/Section 4(f) Impacts	Qualitative Economic Analysis
									Arkansas River shiner critical habitat	NWI wetlands and ponds	NWI riverine area		
Alternative A	**No Build**	Does not address substandard roadway width	Does not address structural deficiency of Bridge "A" or substandard bridge width of Bridges "A" and "B"	None	None, aside from routine maintenance and repairs	None	None	None	None	None	None	No 4(f) use; Threat of continued damage to historic bridge	-If bridge failed due to deterioration/damage, its loss would have a detrimental impact to travel/tourism
Alternative B Option 1	**Bridge Rehabilit-ation at Existing Width**	Does not address substandard roadway width	Bridge "A" will no longer be classified as structurally deficient. Substandard bridge width of Bridges "A" and "B" is not addressed.	None	$21,710,000	None	Two utility relocations $200,000	$21,910,000	1.6 ac	0.03 ac	0.5 ac	No 4(f) use Rehab per SOI Standards; -Threat of continued damage by trucks	-Rehab of bridge would prolong its life span -Threat of continued damage by trucks -Failure of bridge would have detrimental impact to travel/tourism
Alternative B Option 2	**Bridge Rehabili-tation as a Load-Posted Historic Structure**	Does not address substandard roadway width		None	$11,305,000	None	Two utility relocations $200,000	$11,505,000	1.6 ac	0.03 ac	0.5 ac	Rehab per SOI Standards; No 4(f) use	-Detour of heavy truck traffic could be a detriment to the main economies of area -Diminished threat of continued damage and deterioration of bridge by heavy trucks is positive
Alternative C Option 1: Load-Posted Historic Structure	**South Offset with Tie-in to Existing Alignment**	New roadway facility would be built to current standards	New bridge structure would be built to current standards. Existing Bridge "A" will be rehabilitated to address structural deficiency. Bridge "B" would be rebuilt on existing alignment.	None	$46,005,000	16 parcels impacted $380,000	Eight utility relocations $1,060,000	$47,445,000	4.7 ac	9.6 ac	4.3 ac	-No 4(f) use of Bridge "A"; -4(f) use of Bridge "B" from replacement of bridge -4(f) use of historic roadway by proposed tie-in and reconstruction	-Removal of heavy truck traffic would be a benefit to structure's life span -Removal of RVs (over five tons) could deter travelers -Heavy trucks associated with industry would have a safe, new crossing, and would be a benefit

Table 15. Summary Matrix of Project Alternatives

Alternative Analysis Condition		Roadway	Bridge	Hydro-logical Impacts	Construction Cost	Right-of-Way Impacts	Utility Impacts	Total Estimated Cost	Environmental Impacts			Historic/Section 4(f) Impacts	Qualitative Economic Analysis
									Arkansas River shiner critical habitat	NWI wetlands and ponds	NWI riverine area		
Alternative C Option 1: Bicycle and Pedestrian Historic Structure	**South Offset with Tie-in to Existing Alignment**	New roadway facility would be built to current standards	New bridge structure would be built to current standards. Existing Bridge "A" will be rehabilitated to address structural deficiency and converted to a pedestrian bridge. Bridge “B” would be rebuilt on existing alignment	None	$42,870,000	16 parcels impacted $380,000	Eight utility relocations $1,060,000	$44,310,000	4.7 ac	9.6 ac	4.3 ac	-4(f) use of Bridge “A” by removal of vehicular traffic -4(f) use of Bridge “B” by replacement of bridge	-Removal of vehicular traffic would be a benefit to structure’s life span -Removal of ability to drive across bridge could deter travelers
Alternative C Option 2: Load-Posted Historic Structure	**South Offset with New Alignment**	New roadway facility would be built to current standards	New bridge structure would be built to current standards. Existing Bridge "A" will be rehabilitated to address structural deficiency. Substandard bridge width of Bridges "A" and "B" is not addressed.	None	$45,825,000	10 parcels impacted $710,000 1 relocation	Seven utility relocations $915,000	$47,450,000	3.5 ac	7.9 ac	3.4 ac	No 4(f) use of bridge or proposed tie-ins to roadway	Removal of heavy truck traffic from structure is considered benefit for life of bridge - Removal of RVs (over five tons) along bridge could be deterrent for travelers. -Heavy trucks associated with industry would have a safe, new crossing, which would be a benefit.
Alternative C Option 2: Bicycle and Pedestrian Historic Structure	**South Offset with New Alignment**	New roadway facility would be built to current standards	New bridge structure would be built to current standards. Existing Bridge "A" will be rehabilitated to address structural deficiency and converted to a pedestrian bridge.	None	$42,695,000	10 parcels impacted $710,000 1 relocation	Seven utility relocations $915,000	$44,315,000	3.5 ac	7.9 ac	3.4 ac	-Individual 4(f) use of bridge by removal of vehicular traffic	-Removal of vehicular traffic would be a benefit to structure’s life span -Removal of ability to drive across bridge could deter travelers

Table 15. Summary Matrix of Project Alternatives

Alternative Analysis Condition		Roadway	Bridge	Hydro-logical Impacts	Construction Cost	Right-of-Way Impacts	Utility Impacts	Total Estimated Cost	Environmental Impacts			Historic/Section 4(f) Impacts	Qualitative Economic Analysis
									Arkansas River shiner critical habitat	NWI wetlands and ponds	NWI riverine area		
Alternative C Option 3: Load-Posted Historic Structure	**North Offset with New Alignment**	New roadway facility would be built to current standards	New bridge structure would be built to current standards. Existing Bridge "A" will be rehabilitated to address structural deficiency. Substandard bridge width of Bridges "A" and "B" is not addressed.	None	$47,595,000	18 parcels impacted $880,000	Six utility impacts $2,565,000	$51,040,000	6.8 ac	15.4 ac	6.1 ac	No 4(f) use of bridge or proposed tie-ins to roadway	Removal of heavy truck traffic from structure is considered a benefit for prolonged life of bridge - Removal of RVs (over five tons) could deter travelers -Heavy trucks would have a safe, new crossing, which would be a benefit
Alternative C Option 3: Bicycle and Pedestrian Historic Structure	**North Offset with New Alignment**	New roadway facility would be built to current standards	New bridge structure would be built to current standards. Existing Bridge "A" will be rehabilitated to address structural deficiency. Substandard bridge width of Bridges "A" and "B" is not addressed.	None	$44,460,000	18 parcels impacted $880,000	Six utility impacts $2,565,000	$47,905,000	6.8 ac	15.4 ac	6.1 ac	-Individual 4(f) use of bridge by removal of vehicular traffic	-Removal of vehicular traffic would be a benefit to structure's life span -Removal of ability to drive across bridge could deter travelers
Alternative C Option 4	**Reconstruct on Existing Alignment**	New roadway facility would be built to current standards	Bridge "A" will be removed and rebuilt to current standards. Substandard bridge width of Bridge "B" is not addressed.	None	$33,645,000	8 parcels impacted $75,000	Six utility impacts $935,000	$34,655,000	2.4 ac	0.2 ac	1.2 ac	4(f) use of bridge and roadway features by removal of historic bridge	-Loss of historic bridge and the tourism draw it provides would be very detrimental to region and state. -A new, wider bridge in the same location would be of potential benefit for all traffic

Table 15. Summary Matrix of Project Alternatives

Alternative Analysis Condition		Roadway	Bridge	Hydro-logical Impacts	Construction Cost	Right-of-Way Impacts	Utility Impacts	Total Estimated Cost	Environmental Impacts			Historic/Section 4(f) Impacts	Qualitative Economic Analysis
									Arkansas River shiner critical habitat	NWI wetlands and ponds	NWI riverine area		
Alternative D Option 1	**Retain Existing Structure as Off-System Monument under ODOT Ownership**	US-281 traffic would be rerouted to nearby existing highways. The roadway would serve only as an access road for Bridge "A" monument and local properties.	Existing Bridge "A" will be rehabilitated to address structural deficiency and converted to a pedestrian bridge.	None	$16,260,000	$45,000	$755,000	$17,060,000	None	None	None	-Individual 4(f) use of bridge by removal of vehicular traffic	-Removal of vehicular traffic would be a benefit to structure's life span -Removal of ability to drive across bridge could deter travelers
Alternative D Option 2	**Retain Existing Structure as an Off-System Monument and Transfer Ownership of the Structure to a Private or Public Entity**	US-281 traffic would be rerouted to nearby existing highways. The roadway would serve only as an access road for Bridge "A" monument and local properties.	Existing Bridge "A" will be rehabilitated to address structural deficiency and converted to a pedestrian bridge.	None	$8,090,000	$45,000	$755,000	$8,890,000	None	None	None	-Individual 4(f) use of bridge by removal of vehicular traffic	-Removal of vehicular traffic would be a benefit to structure's life span -Removal of ability to drive across bridge could deter travelers

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